POPULAR SCIENCE

MONTHLY

MECHANICS - AUTOS - HOMEBUILDING

25¢ July

Courteous Cops Cut Crashes

PAGE 62

RECEIVED JUN 26 1953

Build Your Own Diving Lung

How to Outwit Poison Ivy

PAGE 116

SCIENCE NOW PROVES YOU CAN

Extra Pep, Speed, Get-Away & Pick-Up YOURS with ANY car!

YOU CAN CUT YOUR COSTS—GET ADDED POWER USING METHODS REVEALED BY SCIENTIFIC SPECIALISTS

You probably read about the recent contest in Illinois—run by one of the world's leading gasoline companies—to discover how many miles could possibly be squeezed out of a single gallon of gas. The winning car came through with 168 miles! This mark was verified by experts in charge of the scientific experiment at Wood River, where the contest was held.

The amazing results were obtained with a standard gasoline, standard stock cars and approved scientific methods. YOU can now reap the benefits of this fantastic experiment and discover HOW TO USE all the eye-opening secrets uncovered at Wood River! You will find all these advanced methods in the amazing new volume, "HIGHER SPEED AND EXTRA POWER"—the *newest* auto manual now available in America!

This remarkable book gives you down-to-earth facts on how to get 30, 40 or *even* 50 miles on a single gallon of gas. It shows you exactly how to get extra car power . . . how to add up to 30 miles per hour to your top speed . . . how to zoom ahead from 0 to 60 miles in 12 seconds flat!

It gives you the very latest inside "dope"—scientific information gathered from automotive engineers, armed forces technicians and industrial experts! You get money-saving, power-building METHODS developed by Indianapolis Speedway champions and contestants in the Sun Valley Economy Run (recently described in TIME magazine)!

EASY PICTURES SHOW YOU HOW

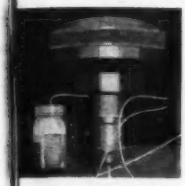
"Higher Speed and Extra Power" makes it extremely easy for you to carry out these labor-saving, cost-cutting ideas. It is chock full of splendid pictures and easy-to-understand drawings—no windy jargon, no complex diagrams or technical blueprints. A child will find it as easy to follow as a first grade reader . . . women can use it with the same simplicity they find in an ordinary cookbook recipe. Down-to-earth directions and clear pictures show you hundreds of ways to get more speed, extra power, greater economy with only a screwdriver. You don't need to be a mechanic AND you avoid the expensive headaches of "sucker" repairs! You learn how to turn a junkyard jalopy into a streamlined eye-filler . . . how to save up to $500 a year in car costs . . . how to increase the re-sale value of your car, no matter how old the model.

100's OF VALUABLE MONEY SAVING SECRETS!

You get hundreds of tips, ideas, methods, tricks, suggestions and FACTS in this amazing new book! Here is some of the DO-IT-YOURSELF information given you: 20 ways to save gas and oil; extra power methods for summer driving; mixing air and fuel, water and gas; better pick-up on hills; rainy weather remedies; 10,000 extra tire miles; "soup-up" tricks; hot rod techniques; simple ways to remove body dents; speed tuning; repair short-cuts; supercharging systems; ventilation and air-cooling secrets.

GET 35-50 MILES A GALLON

Inside Information from Auto Engineers Reveals Amazing Power, Economy Secrets!



U. S. Government Scientist Says "MIX WATER SAVE GAS"

Here's just ONE of the hundreds of marvelous secrets that you'll find in "Higher Speed and Extra Power"—a renowned scientist of the U.S. Government is responsible for this clever money-saver: all you need is a discarded mason jar and a 10-cent piece of hose. You install it in seconds! With it you have a completely modern **Moisture Injector.** It acts in much the same way that rainy weather affects your engine—it causes fuel to burn slower. It lengthens the power stroke, reduces pping and saves you a lot of money! Full details of this cost-cutting device are found on pages 29 and 30 of **"Higher Speed and Extra Power".** You'll be pleased as Punch with the terrific new power you get with this modern water injector!

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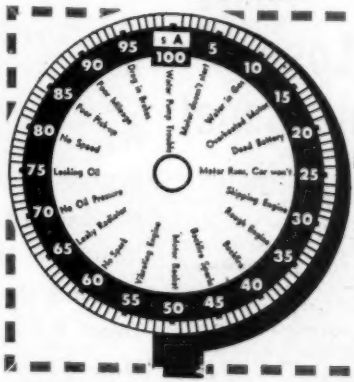

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JULY, 1953

Don't Lose This Issue!

IT IS the first of the 163rd volume of POPULAR SCIENCE MONTHLY. Indexes to the Mechanics and Homebuilding pages of the two previous volumes (12 issues) start on page 187. They are worth saving.

Want to finish something built of plywood? Under *Plywood, Painting* or *Home Maintenance* you'll find *Nine Fancy Finishes Transform Plywood* (April, p. 212). Or do you want to know what gas mileage your car gives? Under *Automobiles* you'll find an article on measuring it—and just in case it's low, there's another on boosting it.

Buying a portable saw? Then you will want to re-read two articles listed in the Index under *Saws and Sawing:* how to use portable saws (Nov., p. 226) and how to make jigs that let them do more (Dec. p. 214).

HARRY WALTON

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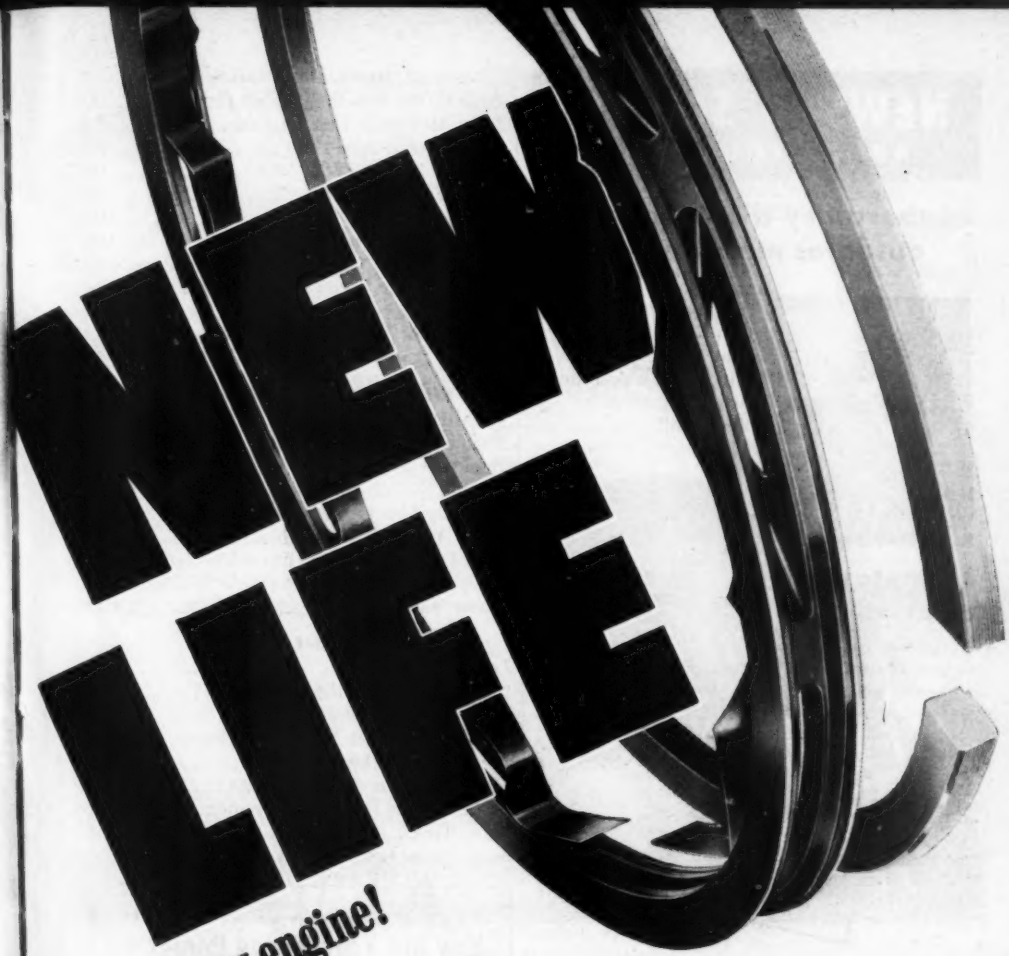

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NEXT MONTH . . .

How Are Your Garage Doors?

A smoothly balanced overhead garage door has a lot in its favor: it glides up out of the way, won't thrash around in the wind, doesn't wedge on snow or ice, and doesn't snag unwary fenders. Next month PSM will tell you how you can fit these doors to your garage at surprisingly little cost, using ingenious new hardware.

Picture yourself going places

You've done it often. Call it day-dreaming if you like, but you've seen yourself in a bigger job — giving orders and making decisions — driving off in a smart new car — buying your family a fine home.

There's nothing wrong with dreams. But how about making them come true? *You can do it,* if you're willing to try!

Look around you. The men who are going places are the *trained* men. They've learned special skills that bring them better jobs and higher pay. It's the men *without* training whose dreams never come true.

What are you going to do about it? Just wait and wish? If you really *want to succeed,* you can get the training you need by studying at home in your spare time. International Correspondence Schools offer you a course in just about any field you choose, giving you the practical plus the bedrock facts and theory. No skimming or skimping! And you'll be earning while you learn. Students report better jobs and more pay within a few months.

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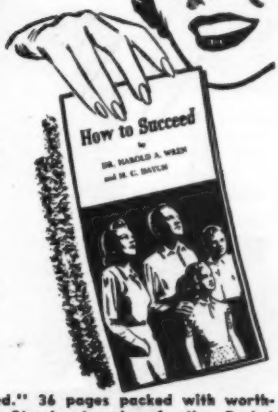
L. P. S., Elkhart, Ind.



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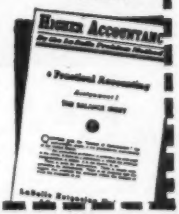

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My Chrysler didn't cost me any $10,000 either.

REV. WM. R. HANNAN, Springfield, O.

Airboat for Borneo

Your article on airboats [May, p. 168] interested me very much because I've had such a boat in mind for about four years. I do missionary work in Eastern Borneo. In

our section there are no roads or trails so I always travel by river. During the past 13 years I guess I've broken a thousand shear pins, figuratively speaking, because of shallow channels and rapids. I'm home on furlough now, but expect to return this summer. An airboat looks like just what I need.

F. R. WHETZEL, Portland, Ore.

Autos Run Mostly on Air

Can you tell me how many cubic inches of vaporized fuel mixture you get from one gallon of gas, when it is combined with the necessary amount of air?

S/SGT. C. A. RAMIREZ
APO 74, San Francisco.

For the best explosive mixture, about 1,000 gallons of air are required for each gallon of gasoline that the automobile engine uses. The gallon equals 231 cubic inches. It can be said then that one gallon of gasoline is converted into 231,000 cubic inches of explosive mixture when it is atomized.

Add Howling Buildings

I noticed that a reader who built a cabin in the woods was disappointed that the wind didn't howl around it to his satisfac-

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tion [Dec. '52, p. 8]. I would like to know how to stop one.

Two years ago, I built a small shop in my back yard. I spend many hours there, making gadgets and reading PSM. There's only one disturbing factor—winter or summer the slightest breeze makes a howl like a thousand yowling coyotes. I would like to trade that reader an A-1 cabin howl, complete with yowls and groans, for a formula for stopping same.

T. J. MITCHELL, Fort Worth, Tex.

Who Has Most Accidents

In your May issue you state that, "High-school kids have more smashups than any other age group." You also say that the accident toll in the teen-age group is "the

highest by far in any age group." I believe that a look at the record will show that the age group which has "by far" the most accidents—more than half of all accidents—is the 25-44 age group.

CHARLES DAY, Groton, Mass.

We should have said accident rate. *In 1951, the latest year for which a breakdown of accidents by age groups is available, drivers 20 years old and younger were involved in 12 percent of all the automobile accidents. Drivers 25 to 44 years old were involved in 52 percent of the accidents.*

But the teen-agers constituted only seven percent of the U. S. population; the older group, 35 percent. For their numbers, the 25-44 group had a better record by eight percent.

Let's Time It Right

In your article on automobile timing lights [March, p. 193], you advise the reader to accelerate the engine and watch the timing mark after the timing has been set. You then point out that the timing mark "should move forward (in the direction of rotation) to indicate that the automatic spark-advance mechanism is functioning."

If the engine fires on TDC while idling,

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then the automatic advance should advance the timing as we accelerate. This would make our timing light flash before TDC and the timing mark would not have reached the pointer. Therefore the timing mark would move against rotation. Right?

EDWIN A. MARSHALL, Natrona Heights, Pa.

Right!

Self-Announcing Records

The suggestion that phonograph records be made with a brief announcement at the beginning telling what you are about to hear [March, p. 131] is at least 50 years old. Between 1903 and 1906 all records had this feature.

ALBERT H. MACMULLAN, Tampa, Fla.

Around 1900 Victor had it on popular-artist recordings, Columbia on operatic recordings.

Overhead Cams

In your article "All About 18 Little Cars" [April, p. 118] you say that the Singer has an overhead cam and that no car in mass production on this side of the Atlantic has one. That's where you're wrong—Crosley manufactures a four-cylinder overhead-cam engine.

ARTHUR F. KOLBERG JR., Baroda, Mich.

You were as right as rain up to the time last year when manufacture of the Crosley was discontinued.

In Defense of Small Ships

A caption in your article "Battling 'Boxer' Flings 1-2 Punch off Korea" [March, p. 126] says that the helicopter has replaced the destroyer as plane guard. I don't agree. Even though the helicopter is in use as a plane guard, destroyers still perform the same task as before.

Let's put it this way: If the large ships didn't have small ships in their company, where would they be? You guessed it—down under with Davy Jones.

R. C. ZASKODA, QMSN, USS WILTSIE
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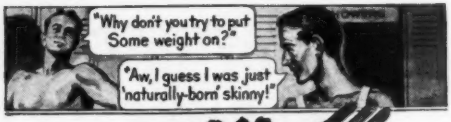

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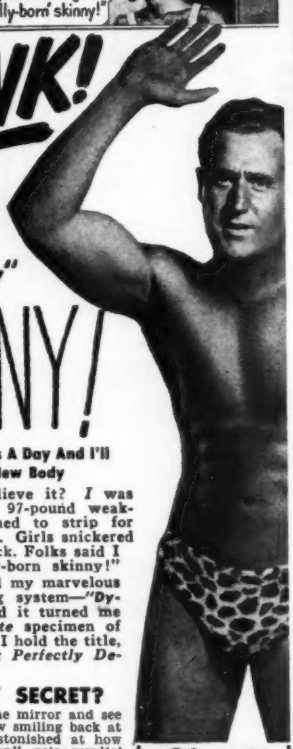

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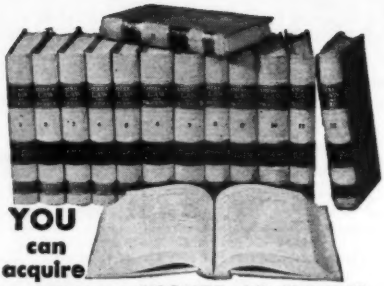

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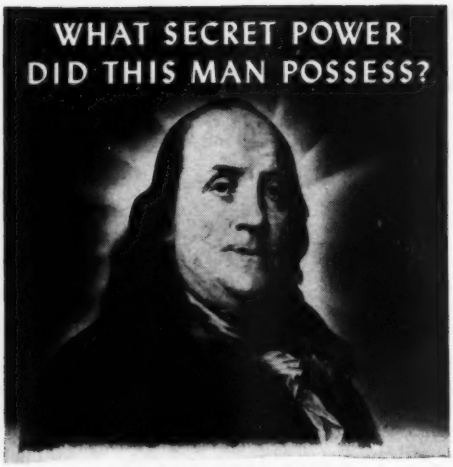

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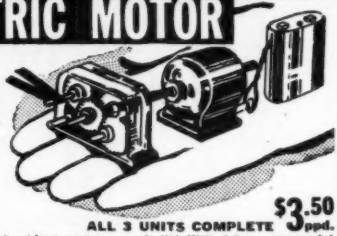

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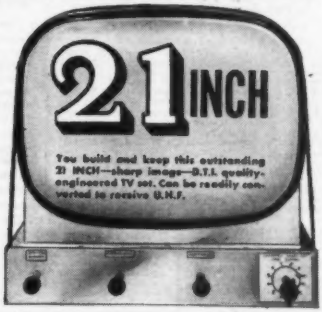

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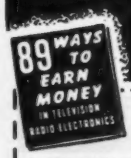

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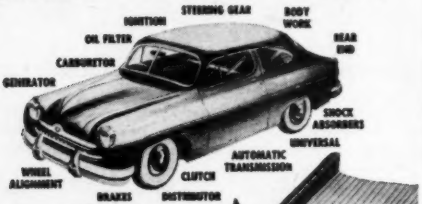

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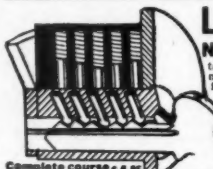

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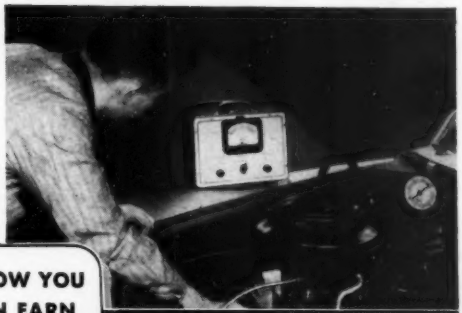

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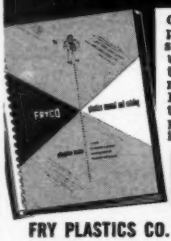

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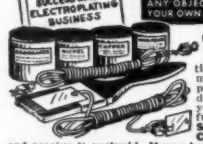

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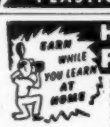

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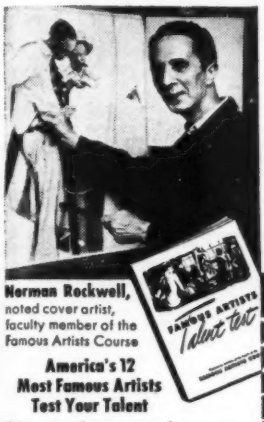

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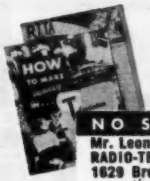

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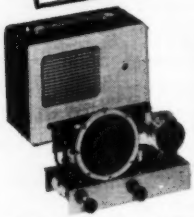

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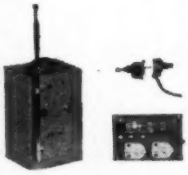

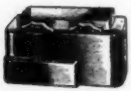

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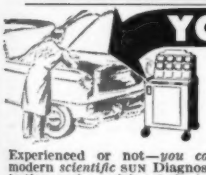

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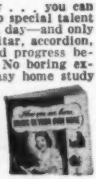

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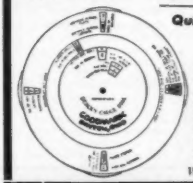

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SONGWRITERS! Protect your poems and songs! Don't mail anywhere! Write for safe procedure! Song Service, 333 W. 56th, Dept. P.S., New York 19, N.Y.

SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PS, New York 23.

FREE record—your words with my tune. Free information. Johnny Mack, Dep't. "K", 1094 West 39 Street, Los Angeles 37.

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ELECTRIC Guitars, accordions, amplifiers. Wholesale. Free catalog. Carvin, Baldwin Park, Calif.

36 RADIO, TELEVISION, SUPPLIES & EQUIPMENT

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FREE Vending Machines; if used to sell our profitable nuts. Continental, Box 1361-B, Milwaukee 1, Wisconsin.

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CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

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$1,000,000 FOREIGN & Domestic Construction Projects published Monthly, gives Contractor & Locale, How-When-Where to apply with application form, $1.00 postpaid. Global Reports, Box 883-PX, Hollywood 28, Calif.

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67 OLD GOLD, JEWELRY, WATCHES, ETC.

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RHINESTONES, jewelry settings, cameos, sequins, beads. Send 10c for Illustrated Catalog. J & M Novelties, Dept. CH-4, Griffith, Indiana.

JEWELRY making. Send 20c for illustrated catalog. Milady-Fair Co., G.P.O. 1328, New York City 1.

68 TOBACCO & PIPES

SET of 3 imported briar pipes $12.98. Smoking satisfaction guaranteed or your money back. Val-Do Products, Box 44, Vanderveer Station, Brooklyn 10, N. Y.

HAND Made Cigars. Write for price list. Ideal Cigar, 1903 Nebraska, Tampa, Florida.

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Reprint of 6-page illustrated article from Vue magazine entitled

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The subject of this amazing article is Miss Patricia Stenz who, for nearly 20 years, has been promoting the growth of hair so successfully that she now operates 3 jam-packed clinics in Los Angeles, and has a mail order clientele throughout the U.S. and many foreign countries.

Miss Stenz does not claim to grow hair in 20 minutes. The story, titled by Vue Magazine editors, deals with her demonstration — made many times, for many people—that even entirely "bald" heads often have considerable live hair, completely grown over by membraneous tissues, which ordinary scalp treatments do not penetrate. Microphotographs in the Vue article show that when this tissue is penetrated by a 20-minute Stenz treatment, hair may appear dramatically over a considerable portion of the formerly bare scalp.

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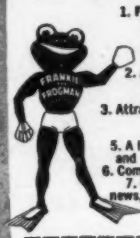

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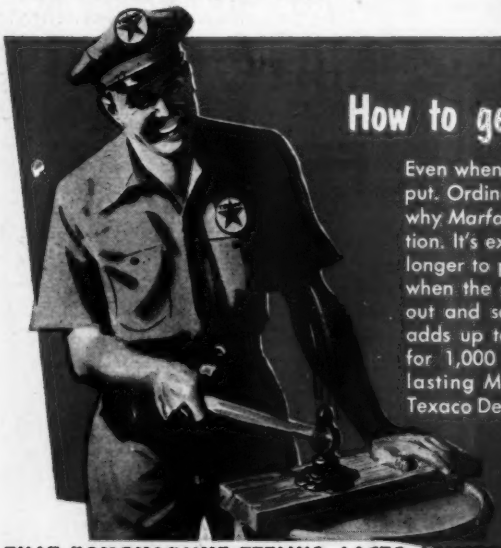
Texaco Tips on car care

How oil filter inspections save you money

If your car's oil filter is clogged, it can't filter out dirt and other abrasives that occur in normal engine operation. And that can mean trouble and expense for you! To keep your oil filter functioning properly, see your Texaco Dealer for an oil filter check-up. He will inspect it — and replace it, or the filter cartridge if necessary. This assures a constant flow of cleaner oil to your engine's moving parts. Care like this can help you enjoy more miles of trouble-free motoring.



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POPULAR SCIENCE
REG. U. S. PAT. OFF., Monthly

They Trap Counterfeiters Everywhere

When a counterfeiter is arrested by Interpol member, he is turned over for trial to the country with the strongest case against him.

International cops now cover a 48-nation beat in their fight against the phony-money racket.

By Phil Gustafson

A NEW and deadly weapon for use against civilian populations emerged late in World War II. Like the Germans' V-2 rocket, it came too late to be decisive, but in another war things might be different. It might even be turned against us as a tactic in the cold war.

That weapon is counterfeit money.

The Nazis boldly recruited professional bogus-money artists, and in the Sachsenhausen concentration camp near Berlin set up the biggest counterfeiting plant the world has ever known.

Hitler planned to shower England with fake notes, parachuted from planes, but the Luftwaffe lost control of the air

over the British Isles before the stunt could be pulled. The Nazis did circulate so many false bills through neutral embassies and commercial channels that the Bank of England finally was forced to withdraw all pound notes of three denominations and issue others in their stead.

Total-war strategists picture what might happen if great quantities of bogus money were dropped by parachutes in a town. They visualize workers scurrying along the streets, furtively picking up bills. Workers reporting in sick and rushing off to the stores. All the stores swamped with bad money and forced to close their doors. "Infected" towns isolated by the High Command to keep the bad money in. All forms of travel forbidden. Buying and selling halted.

Hitler planned to shower England with fake notes, parachuted from planes, but the Nazis lost control of the air.

When bankers and government officials think about such things now, they feel a lot happier because they know that a world-wide network of anti-counterfeiting sleuths is operating around the clock in a little-publicized but highly effective organization called Interpol.

Interpol is the everyday name for the International Criminal Police Commission which links national police organizations of 48 nations—the Sûreté Nationale, Scotland Yard, Rome's Questura, our own Treasury Department, police headquarters of Athens, Istanbul, Sydney, Johannesburg, Rangoon—each with its own specialists who devote full time to bringing international counterfeiters to grief.

The fight against counterfeiting is so universal that Interpol even gets co-operation from bankers behind the Iron Curtain.

It used to be possible to pull a big coup in bad money and light out for some far corner of the world like the South Sea Islands—there to languish among the dancing girls without fear of detection. That's the way it *was*.

But, brother, don't try it today. By radio, teletype, telephone or airmail, information on your departure will go out to 48 nations. No matter where you get off the boat, chances are you'll be shadowed when you move away from the dock.

Headquarters of this anti-counterfeiting net is in the long, low Ministry of the Interior Building in Paris. Here, in Interpol's International Bureau, the world war against bogus money is carried on by a special counterfeiting section of some 15 persons, mostly trained police specialists.

And here I ran across the most interesting set of files I've ever barked my shins on. The most fascinating of all is a section which houses a record of every kind of bogus money in the world—escudos from Portugal, cruzeiros from Brazil, pesos from Mexico, rials from Iran, dinars from Iraq, rupees from Pakistan—some 800 specimens in all. In the dollar file alone are 335 different types of phony bills.

Phony-Bill Photos Go Around World

Whenever a new type of bogus money is turned in by one of the member countries, the International Bureau gets up a printed folder with photos, descriptions and classifications of the money and a detailed account of the case. These folders are fired out by the fastest means to national police offices and banks around the world. All these

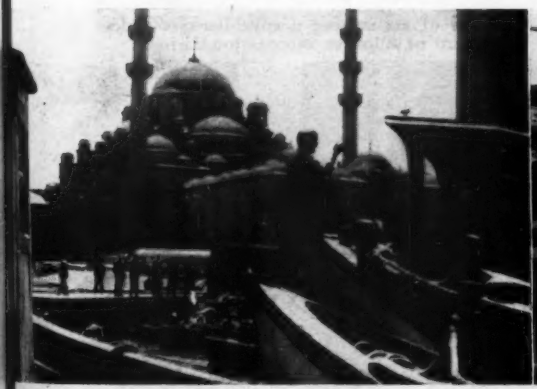
The Case of the Bogus-Buck Passer

These scenes from a new documentary movie, made by the U. S. Mutual Security Agency in Paris, show how Interpol directs the police of three nations in tracking down a counterfeiting ring.

1 EXACTING CUSTOMER exchanges U. S. dollars for an expensive bracelet in a smart Amsterdam jewelry shop. Store owner is pleased—until his bank finds bills are bogus.

2 AMSTERDAM POLICE scan bill for peculiarities in design and printing, compare it with replicas in Interpol book listing all known types of phony money.

3 ROGUES' GALLERY PHOTOS are shown jeweler, who recognizes suspect. Police then notify Paris headquarters of Interpol, which sends file on man to 48 member countries.



4 FAST-MOVING counterfeiter's next stop is Ankara, Turkey. Here he again succeeds in passing bad money for costly jewelry. Proprietor of store calls mobile police.

5 CULPRIT, a slippery customer, hurries to airport after making purchase and boards Paris-bound plane. Ankara police meanwhile have identified him from Interpol file.

To see how counterfeiters were trapped, please turn page.

6 **TURKISH COPS** arrive at airport just as plane takes off. Counterfeiter has escaped again. But Paris police are alerted to pick him up on arrival.

7 **PARIS POLICE** shadow suspect instead, hoping he will lead them to head of ring. They see him get money from an accomplice. When men leave cafe, both are followed.

8 **SECOND MAN** is trailed to door of print shop, where he stops and looks around anxiously. Police have picked up first counterfeiter just as he was boarding train.

9 **THE TRAIL** may be false, but detectives take no chances. When suspect enters shop, they signal reinforcements who have been standing by, and close in on press.

10 **DETECTIVES BREAK THROUGH** false wall at rear of shop and capture chief forger.

Arrests of remaining accomplices complete smashup of another international ring.

folders, bound together in a hard cover, make a book as big as Webster's International Dictionary.

Its opposite number is a similar book listing, describing and illustrating every type of good money in use today.

Fourteen file drawers are crammed with up-to-date records of every known counterfeiting case in all of the 48 member countries as far back as 1926. Each folder contains the record, specialty and characteristics of each of the individuals involved, plus his photo and fingerprints if available. On international gangs, there are charts that diagram the movements of money between the members.

Countries Get Data on Culprit

When the national police of any member of Interpol arrest a man on charges of counterfeiting, the essential information is sent out to the other 47 countries by teletype, followed by a printed circular containing photos, fingerprints and all available details. This vast circulation often results in returns showing that the suspect is wanted in several countries, and in this event he is turned over for trial to the country with the strongest case against him.

The scope of Interpol's tireless operations is well illustrated by the record on Ben Graumann, a 60-year-old Pole who has a record of a dozen convictions in six countries over a period of 20 years. Among other things, he has been an international trafficker in false money under six different names, on dozens of different false passports.

Graumann's latest brush with the law occurred after the West German police discovered a printing plant turning out bogus $10 scrip bills in a refugee camp. After circulating his record, Interpol found that there was a better case against Graumann in Paris, where he was charged with committing a jewel holdup two years before while traveling with a false Spanish passport under the name of Fernando Ordas. The German case against Graumann was shelved while a French court put him out of circulation for some time on the jewel-theft conviction.

Counterfeiters, traveling by air, are the fastest-moving criminals in the world. In one recent case, Interpol reached halfway around the world for one pair. The case came into the International Bureau when Secret Service in Washington asked member countries to watch out for two men who had been using counterfeit dollars to buy moving picture equipment. A month later, they were in custody. One of the pair, Percy Lean, convicted thirteen times for assault, rape, gambling and fraud, had strong cases against him in such widely separated points as England and South Africa. His partner, Raymond Bassett, was handed back to authorities in Australia who put him away for stealing automobiles.

In France alone, police ran down 10 counterfeit printing offices in a year. Cases have decreased 40 percent since 1948 but the specialists of the Bureau still handle an average of 500 cases a year.

One of Interpol's most interesting characters is Sale Somodoff, born in 1895 in Poland and rated as the best designer

[*Continued on page 216*]

By radio, teletype or telephone, information on the culprit's departure will go out to 48 nations. No matter where he gets off plane or boat, the law will be waiting for him.

Radiator Keeps Food Hot

LIKE the warming oven of an old-fashioned coal stove, this cupboard built into a radiator will heat rolls, keep food warm between servings or hold over dinner for a late-comer. An Italian invention, the dual-purpose radiator is in use in the homes and restaurants of Florence.

Convertible Window Zips Out

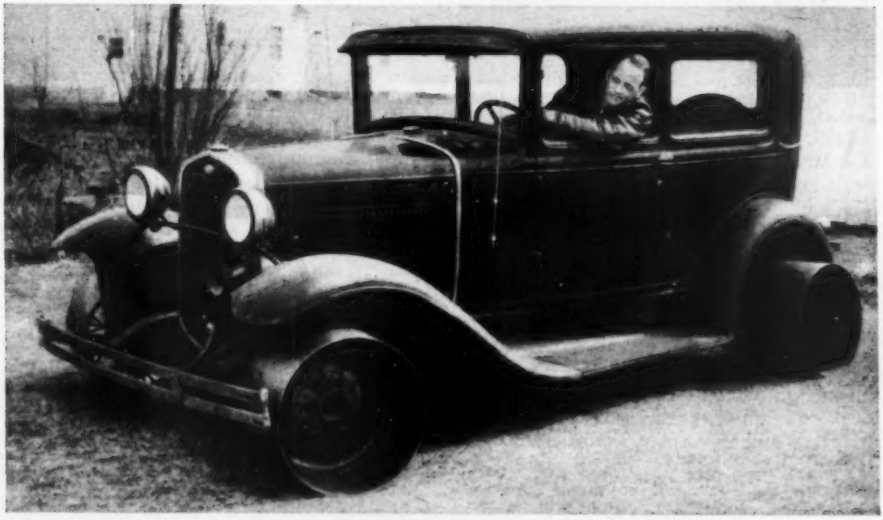
ZIP—and the plastic rear window of this convertible is out. Zip it back into place and a pair of rubber lips fold over the metal teeth of the fastener to seal out air and moisture. A wartime development of B. F. Goodrich, the self-sealing zipper is now in use on the Mercury and the Lincoln.

You Can Ride This Table Saw to Work

HAVING carried the carpenter and his table saw to the job, the baby tractor at left now powers the whirling blade. The same two-cycle, 1½-hp. gasoline engine does both jobs. Latest brain child of Stanley Hiller, Jr., boy wonder of the helicopter industry, the little riding tractor can also haul mowers, a spreader, a cart, a roller or a sweeper. A double-pulley arrangement provides two speeds forward. Low, with a 40-1 reduction, gives two m.p.h.; high, four m.p.h. The 127-lb. tractor is said to be able to carry a 250-lb. man up a 26 percent grade while hauling a 360-lb. roller. Besides a clutch, there are ratchet clutches in each of the rear wheels, so that the inside wheel can be disconnected from the drive for a sharp turn.

Undercover War—on Termites

THEY'RE not gift-wrapping that house above, they're getting ready to fumigate it. A penetrating gas fed from a cylinder through tubing under the plastic tarpaulin (right) diffuses into every cranny of the house to exterminate wood-happy termites. The system, pioneered by the Neil A. Maclean Co., Los Angeles, is in use in subtropical California, Florida and Hawaii.

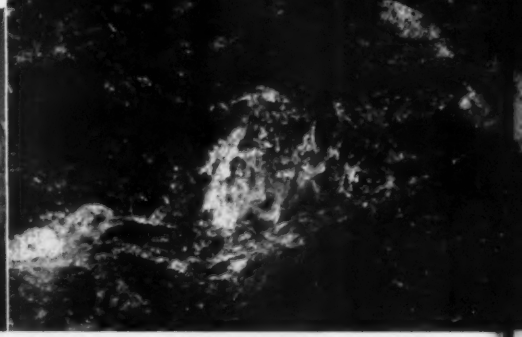


Gardener Rigs Up Car to Iron Out Lawn Problems

W. J. LESTER, a gardener of Rockford, Ill., got tired of pushing a heavy roller over expansive lawns so he adapted his car to do it for him. He rolls to the job on conventional wheels, then jacks up the car and replaces the tires with four rollers.

How to Train a Seal

Trial and error are the steps on which he climbs from savage pup to star performer.



SHARKEY TO THE RESCUE. A weighted doll is thrown into the water. The seal dives, comes up under the doll, balances it on his nose and climbs up on a stage. When he can do this trick, a seal is ready for his diploma.

ADS, cartoons and hundreds of magazine and newspaper stories about trained seals have implanted the impression that a seal's chief mission in life is to balance a ball on its nose. Nothing could be farther from the truth. A seal is a marvelously intelligent animal. He can be taught to do almost anything within his physical limitations.

Trained seals aren't really seals at all. They're California sea lions. True seals haven't got what it takes to make top billing in show business. Their necks are too short; they are stubby and awkward. Sea lions, on the other hand, have long flexible necks, are graceful, beautiful animals. And they are always called seals in the entertainment world.

The career of trained seals starts early in life. They are netted when from one to four years old. Like humans they have to be taught. The first lesson comes from mother, who teaches them to swim. When first captured they are confused. Everything is unfamiliar. They become frightened. Afraid of a man, they will run away from him or attack him.

The first job of a trainer with a new seal is to condition him to his surroundings. He must learn to look to his trainer for food and security. Once a seal has learned to trust his trainer, he becomes anxious to please. The extent of his training is limited by one big factor—the man's ability to make the seal understand just what he is supposed to do.

To show how a seal is trained, PSM photographer Bill Morris used a 16-year-old veteran, Sharkey, as a model. He knows all the tricks, hundreds of them. His home is Seal College, Kingston, N. Y., where he exercises every day in a 15- by 30-foot pool —that is, when he is not on the road, a star of stage, screen, radio and television.

TRICK BELOW IS KINDERGARTEN STUFF. At first the pole is held slightly under water so the seal can swim over it. It is raised gradually until he has to hurdle the pole.

A SEAL MUST BE TAUGHT to eat dead fish, which he doesn't recognize as food as he is used to the live, swimming kind. Dangling a fish on a string soon changes his eating habits.

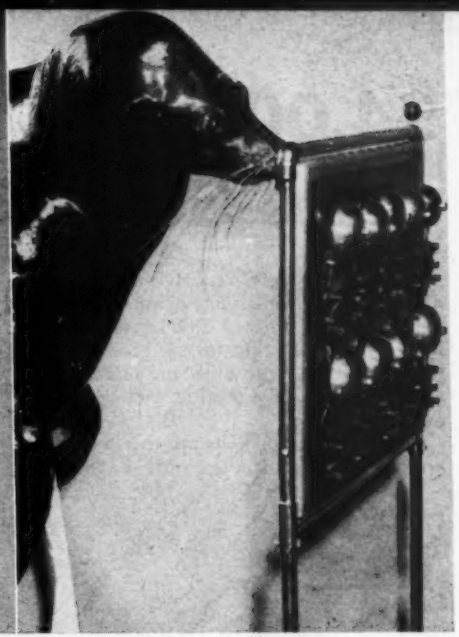
IN EARLY STAGES of training, a seal is unfriendly, may attack savagely. During this familiarization period the trainer protects himself by wearing steel and leather pants.

BALANCING A BALL on his nose doesn't come easily for even the smartest seal. First he is taught to nuzzle it. Constant praise and rewards of fish put over balancing idea.

"GIVE US A KISS," says trainer William Roe. At this stage the iron pants can be eliminated. Confidence and understanding between animal and trainer have been established.

A TRIUMPH IN SEAL TRAINING. Sharkey balances tempting fish on nose and waits until he gets signal that he may toss it into the air and eat it. Seals are always hungry.

MOUNTING A PEDESTAL while balancing an object is the next step. Pedestal is a trained-seal act tradition. It elevates him and gives the audience a better view of the show.



RINGING BELLS to play a tune is part of advanced course. Trainer teaches trick by using baton to indicate the sequence in which the seal should nose the bell buttons.

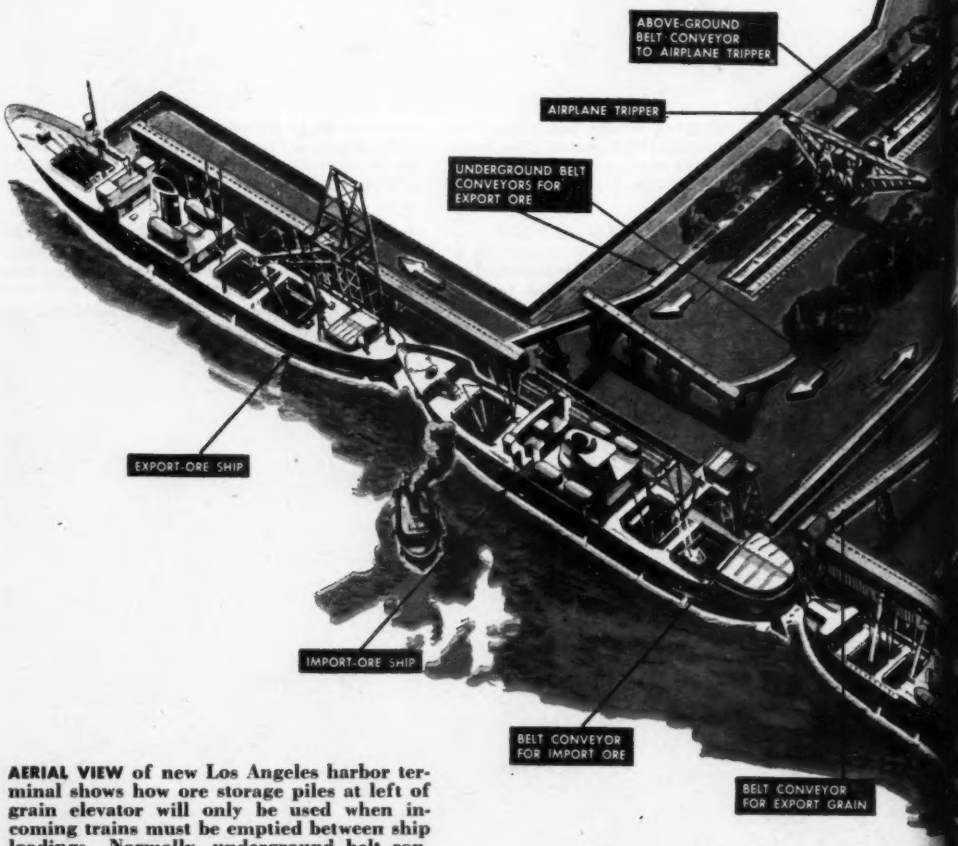
A TOUGH ONE, even for a seasoned seal performer. For this act, the seal is fitted with a leather mouthpiece to which is attached a short protruding steel prong. The trainer throws a wooden disk, with a one-inch hole in the center, into the water. The animal must dive and come up under the disk so that the prong enters the tiny hole. END

$4,000,000 'Cafeteria' to Serve 3 Ships Daily

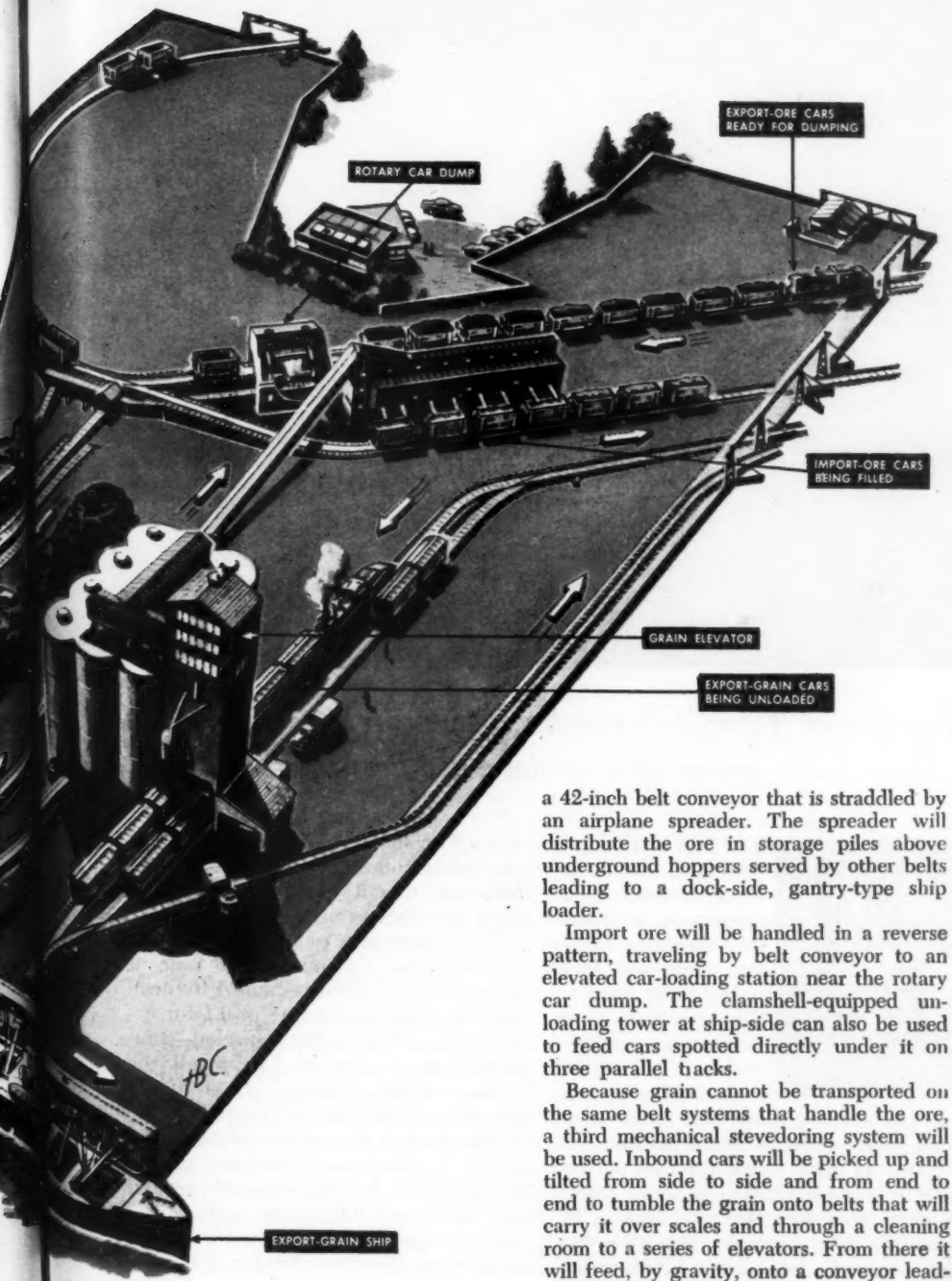
A CAFETERIA-STYLE marine-rail terminal that will dish out helpings of grain and ore at the rate of 2,600 tons an hour soon will be catering to the greedy appetites of grain and ore ships and railroad cars entering the heart of the Los Angeles harbor district.

Speedy conveyor belts are the key to the operation. Running smoothly through weatherproof housings above and below ground, they will carry the bulk shipments dumped onto them at 15 points in the 28-acre yard and discharge them at 13 others to keep 800 cars and three 10,000-ton freighters moving in and out of the terminal each day.

Cars carrying export ore will be picked up bodily and their contents rolled onto



AERIAL VIEW of new Los Angeles harbor terminal shows how ore storage piles at left of grain elevator will only be used when incoming trains must be emptied between ship loadings. Normally, underground belt conveyor at left of airplane spreader forms direct route from car dumper to ship. Bulk Unloaders, Inc., will operate the yard.



a 42-inch belt conveyor that is straddled by an airplane spreader. The spreader will distribute the ore in storage piles above underground hoppers served by other belts leading to a dock-side, gantry-type ship loader.

Import ore will be handled in a reverse pattern, traveling by belt conveyor to an elevated car-loading station near the rotary car dump. The clamshell-equipped unloading tower at ship-side can also be used to feed cars spotted directly under it on three parallel tracks.

Because grain cannot be transported on the same belt systems that handle the ore, a third mechanical stevedoring system will be used. Inbound cars will be picked up and tilted from side to side and from end to end to tumble the grain onto belts that will carry it over scales and through a cleaning room to a series of elevators. From there it will feed, by gravity, onto a conveyor leading to ship-loading chutes.

New Jersey Turnpike's crack safety patrol serves as a model for other superhighways.

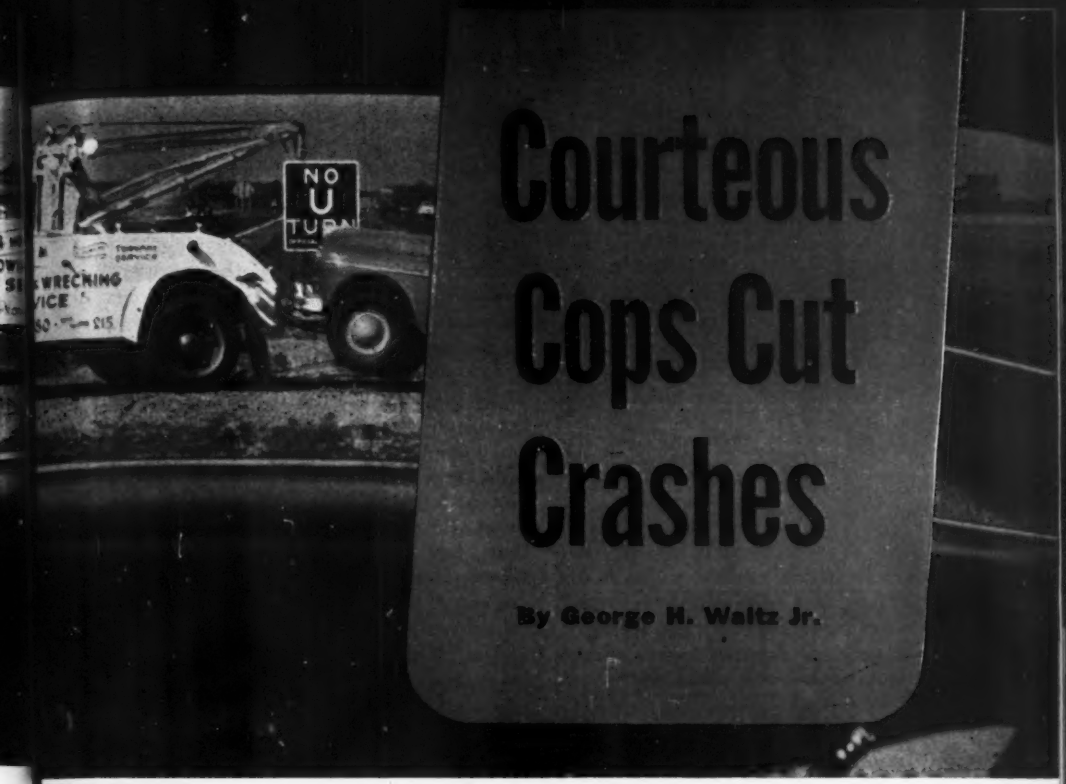
EVERY morning at eight, rain or shine, a dozen men climb into a dozen cars and begin driving along the 118-mile New Jersey Turnpike—the East's newest superhighway. By four each afternoon, each man has clocked about 200 miles, seen to the safety of some 20,000 drivers.

These 12 men make up one of the three 'round-the-clock patrols of New Jersey State Police that are helping to make the mile-a-minute Turnpike the best-patrolled and safest high-speed road in the country. They are a part of a crack 65-man detachment of troopers who blend courtesy with strict law enforcement to cut down accidents and speed motorists on their way.

Their courtesy is paying off in safety.

During the Turnpike's first year of operation, 1952, deaths caused by accidents occurred at the rate of 6.1 for every 100 million miles traveled—compared with a rate of 7.7 for all the national highways and a rate of 7.3 for the older Pennsylvania Turnpike.

This year, if the record of the early months is maintained, fatalities on the Turnpike will be cut down to around four for every 100 million miles traveled, perhaps even lower. That would be an all-time safety record for a heavily traveled road.



Courteous Cops Cut Crashes

By George H. Waltz Jr.

Every Turnpike trooper is a graduate of the New Jersey State Police Academy in West Trenton, N. J. There he learned motor mechanics, first aid, traffic control and accident investigation. To enter the Academy he had to be between the ages of 22 and 35, a high-school graduate, weigh at least 150 pounds but no more than 225, top 5 ft. 8 in., and be physically perfect.

Troopers Can Handle Anything

This training, plus required years of experience patrolling other Jersey highways before being assigned to the Turnpike, fit a Turnpike trooper to handle just about any kind of an emergency, from delivering a baby to coping with a gun-toting hoodlum.

And on the Turnpike he is likely to be called on to do both. Last year the troopers, besides aiding motorists and passing out traffic tickets, made 295 arrests for criminal violations ranging from armed robbery to the illegal possession and transportation of narcotics.

The fast, radio-equipped cars the troopers drive have been selected after long tests on the road. Besides a fleet of 23 blue-and-white police cars—Fords fitted with Mercury engines, dual exhausts, souped-up rear ends and heavy-duty cooling systems—there are 10 sleek, unmarked black Chrysler sedans. These black Chryslers, capable of 120 m.p.h., look just like other cars except for their drivers' light-blue uniforms.

Backing up the troopers and their patrol cars are three portable radar timers that can be set up at any point along the road for instantaneously clocking cars and alerting patrol cars. There is also an integrated three-way radio hookup that allows the cruising troopers to talk with each other as well as with the dispatchers at headquarters.

Recently, I spent the better part of a week riding with the troopers in their

patrol cars and talking with them around headquarters, learning firsthand just how superhighway accidents are born and how they can be avoided.

As each trooper starts out on his Monday patrol he knows that by week's end he and his patrolmates will have felt obliged to hand out at least 300 tickets for speeding and foolhardy driving. He also knows that he will be called on to help out with about 700 assists to motorists stalled by empty gas tanks, blowouts, broken fan belts and motor failures.

Breakdown of Summonses

During a recent week, the batch of summonses broke down like this: 240 for speeding (210 for speeds between 60 and 70, and 30 for speeds above 70), 17 for failing to drive on the right, 21 for unregistered cars and unlicensed drivers, two for impeding traffic, 10 for careless and reckless driving, and a dozen or so for miscellaneous violations.

The 700 weekly assists to motorists included aid to 150 who had run out of gas (even though gas stations are located every 20 or 30 miles), 220 who needed to be towed because their cars had broken down, 170 who had flat tires and 20 whose fan belts had parted under the strains of high-speed driving.

This weekly total, say the troopers, pinpoints two major causes of accidents on superhighways: (1) the cocksureness of the driver who thinks he can handle his car as well at 60 or more as he can at 35 or 40; and (2) the poor mechanical condition of many cars.

To the trooper, giving a ticket is mainly a means to an end. It gives him a chance to establish in one more driver's mind, through his pocketbook, the fact that speed laws are made for safety—his safety. It is also an opportunity to give one more driver a friendly lecture on safe driving.

The value of safety education and preventive policing was dramatically demonstrated shortly after the Turnpike

Flat tires account for about 170 of the assists that troopers give motorists every week.

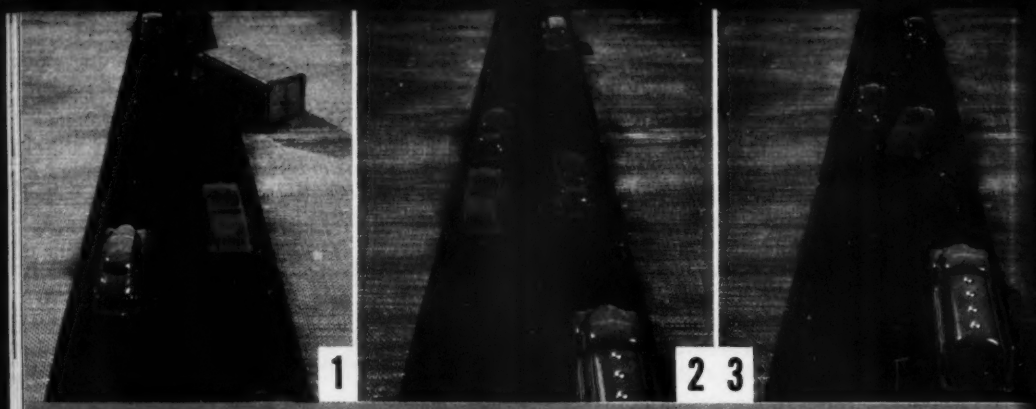
was opened to traffic. Records soon showed that Friday was the worst accident day, with a large percentage of the accidents involving servicemen on weekend passes heading north from Army camps. Pushing for time, many a driver fell asleep and plowed his car and his mates into fatal trouble.

Immediately, the Turnpike Authority, with the help of the Armed Services, started a safety-education campaign. Safe-driving posters were displayed at the camps, safe-driving reminders were handed out with all weekend passes and every car driven by a serviceman was flagged down by a trooper as it entered the Turnpike and its occupants given a 60-second briefing on safe driving. The program is still in effect and accidents involving servicemen have all but disappeared from the weekly statistics.

Up until now, no one has come up with any set of sure-fire rules for safe superhighway driving. Too many factors other than speed are involved. Speed

700 ASSISTS A WEEK are given to motorists by the Turnpike troopers. Among other things, they help some 220 motorists stranded by breakdowns by radioing for tow trucks.

Special dry-powder extinguishers carried in the patrol cars douse gasoline fires quickly.



What Is the Convertible Doing Wrong?

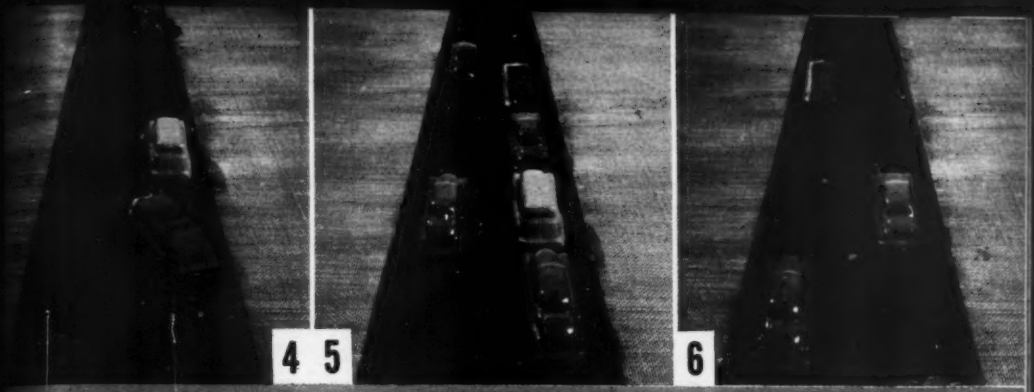
Next to excessive speed, these are the six most common causes of superhighway accidents.

PATROL EQUIPMENT carried in trooper's car includes two kinds of fire extinguishers—a liquid type for fighting truck-tire fires and a powder type for gasoline fires.

alone doesn't cause most accidents, it just makes them worse. However, the facts learned by the New Jersey Turnpike's troopers do form a pattern for safe driving that can be applied to any high-speed, nonstop road:

- Stay under the posted speed limit—the road was designed originally for that top speed. In bad weather, cut that top speed at least in half. In any case, never drive at any speed that tenses you. Don't exceed your personal speed limit.
- On the other hand, don't drive too slowly. Slowpokes cause accidents, too. If you're uncomfortable at the slowest pace of traffic, don't drive on superhighways. Use the parallel roads.
- Don't hang onto the tail of the fellow in front of you. Never have less than a yard of road between your car and the

Ten unmarked Chryslers and 23 blue-and-white police cars are used by the Turnpike patrol.



1. Failing to slow down for slower-moving trucks or trucks pulling back onto the highway. 2. "Bumper riding." Riding too close to the car ahead. Leave one yard for every mile of speed. 3. Passing a car on the right. 4. Not allowing enough time or space when passing another car. Turning out too late or cutting back into right lane too soon. 5. Going too slow for normal superhighway traffic and holding up cars behind. 6. Deliberately staying in the left or passing lane after passing a car.

one ahead for every mile of speed. (At 60 m.p.h. that's 60 yards or 180 feet.) You'll need that much space to stop or change course in case he does.

• Give yourself plenty of time and space when passing a car or a truck, particularly a truck. Comparative speeds are difficult to judge when you are traveling fast. On the New Jersey Turnpike in 1952, 36 percent of all fatal accidents were caused by rear-end collisions.

• Keep right, except when passing.

• If you get drowsy, don't pull off on the shoulder of the road for a snooze. Park completely off the highway or, better still, drive to the next service and restaurant area. Park there and sleep.

• Don't take car on a superhighway unless it is in top mechanical condition.

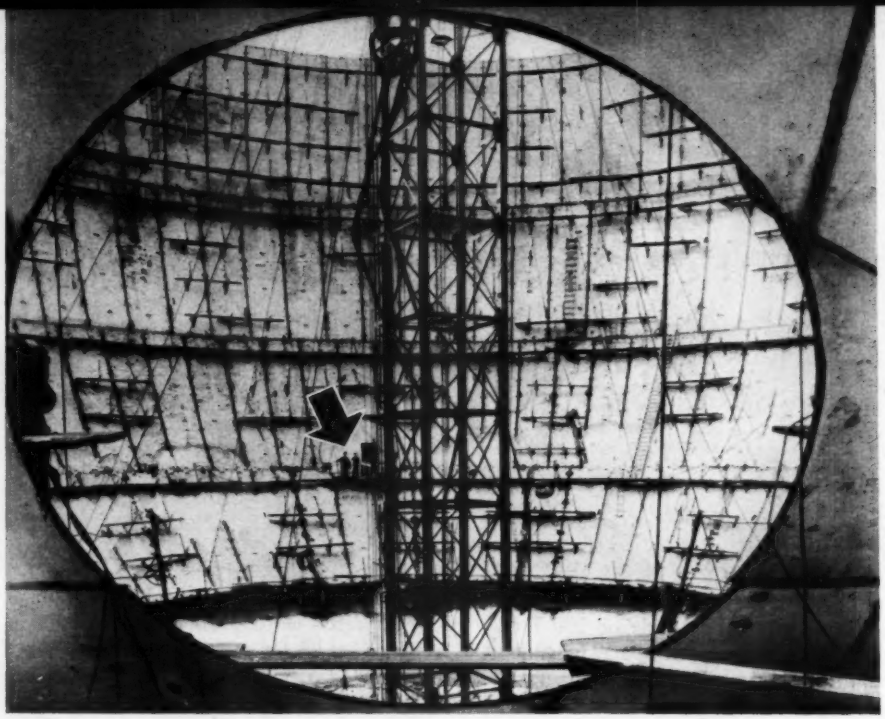
• Add a red flare or heavy-duty lamp to your tool kit for use as a danger signal if your car breaks down at night and you can't get it completely off the highway.

• If you are off on a vacation tour, don't plaster your windshield and windows with stickers. It's much more important to be able to see where you're going and stay alive than to brag about where you've been.

• Finally, when you drive on a superhighway, make it your full-time job. Remember, when it comes to safe driving, car manufacturers haven't yet devised mechanical substitutes for your eyes on the road, your mind on your driving and both hands on the wheel. END

TROOPERS MIX COURTESY with law enforcement when ticketing speeders. They try to impress driver with idea that speed laws are made for his and other drivers' safety.

OUT-OF-STATE SPEEDER may park car at an interchange while trooper takes him to court to pay fine and returns him to car. Home-state speeder gets ticket returnable in five days.

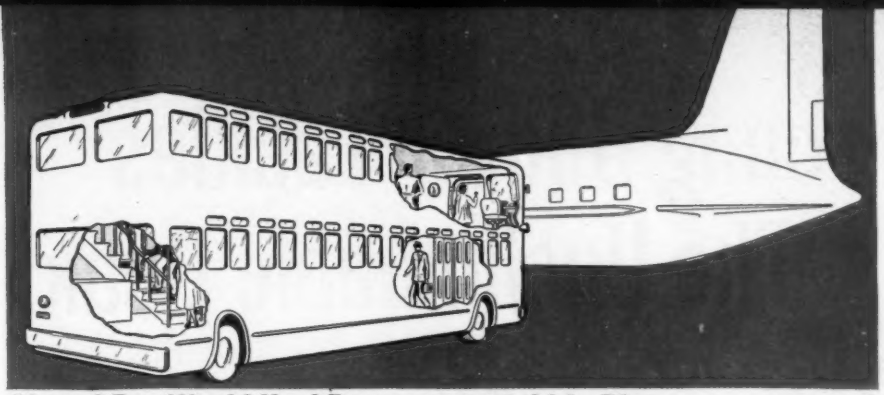


Looking into Huge Globe to Hold Sub's Atomic Power Plant

THROUGH an entrance-lock opening, the camera peers into a half-completed, 225-foot-diameter steel sphere that will enclose a submarine's atomic power plant being developed by General Electric at Schenectady, N. Y. At far side, men (arrow) in similar opening show comparative size. The airtight globe would safeguard the countryside against escape of a radioactive cloud from a "runaway" reactor, if safety controls failed.

Liquid Fuel Runs Atomic Pile

LARGEST liquid-fuel atomic pile to date, the AEC's experimental "homogeneous reactor" at Oak Ridge, Tenn., has just had its first public showing. At left, operators man its controls as they did when they recently harnessed it to generate 150 kilowatts of electric power. Instead of fuel rods of uranium metal, it uses uranium salt dissolved in water, simplifying fuel replenishment and by-product recovery. Experts call it a pilot-size version of a promising type for future large-scale atomic power.

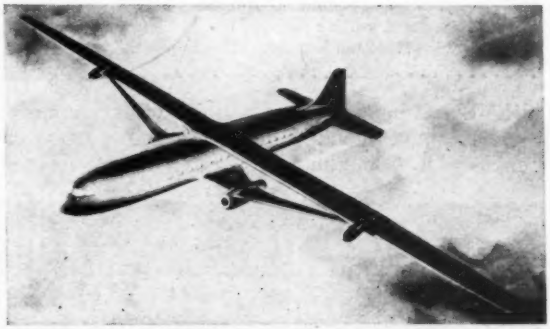


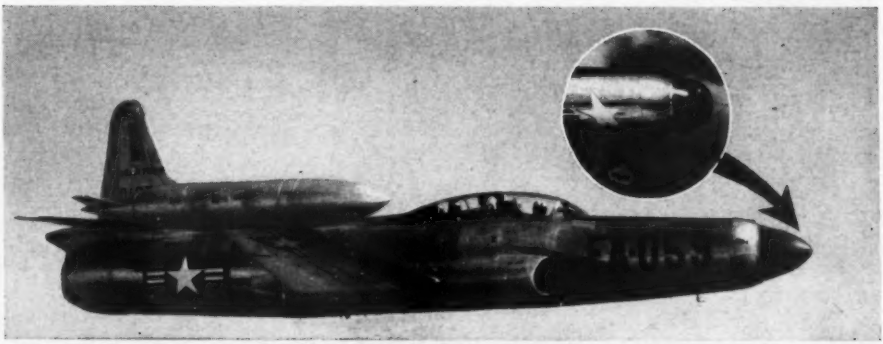
Airport Bus Would Haul Passengers Right to Plane

As AIRPORTS spread over more acres to accommodate larger planes carrying more passengers, and jet transports edge closer looking for elbow room, engineers are busy anticipating traffic snafus. E. W. Fuller of American Airlines has come up with one answer—a mobile gatehouse. The double-decker bus would eliminate the building of costly concrete aprons and loading fingers, and would allow planes to take on or disembark passengers as far as a mile and a half away from the embarkation terminal.

New Wing to Lift More

MAURICE HUREL, French designer, believed that a narrow, knifelike wing with a wide span would lift heavier loads than a conventional wing. After building two such propellered planes for the French Government, he now has designed a similar turbojet job (right). It will carry 80 passengers and have a cruising speed of 452 m.p.h., Hurel estimates.





Jet-Powered Starfire Now Gets There Faster by a Nose

THE F-94C Starfire (above) has undergone a little plastic surgery to reshape its nose. The change-over from the bulb-like plastic radome shown in the inset to the streamlined, pointed ellipse resulted in a five-mile-an-hour increase in speed. Key units of the Lockheed plane's electronic gear are carried in the radome.

Young Doctor Tackles "The Unclimbable Peak"

New Englander leads team of Americans against perils of second-highest mountain.

By Gardner Soule

"Something hidden. Go and find it. Go and look behind the Ranges—
Something lost behind the Ranges.
Lost and waiting for you. Go!"
RUDYARD KIPLING, "The Explorer."

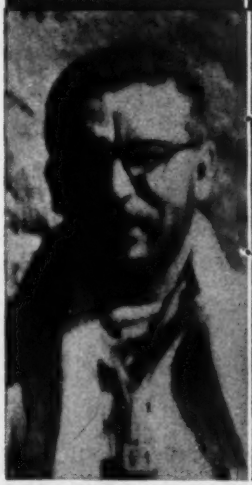
SEVEN Americans and one Englishman have gone behind Kipling's ranges to try something that's rarer than trying to climb Mount Everest. They're attempting to scale Godwin Austen, or K-2, the world's second-highest mountain after Everest alone—and second to none in frightfulness.

One detail that makes K-2 appalling is the final climb to the summit: up the sheer sides of a 12,000-foot-high pyramid of rock so rotten it often falls away from under you.

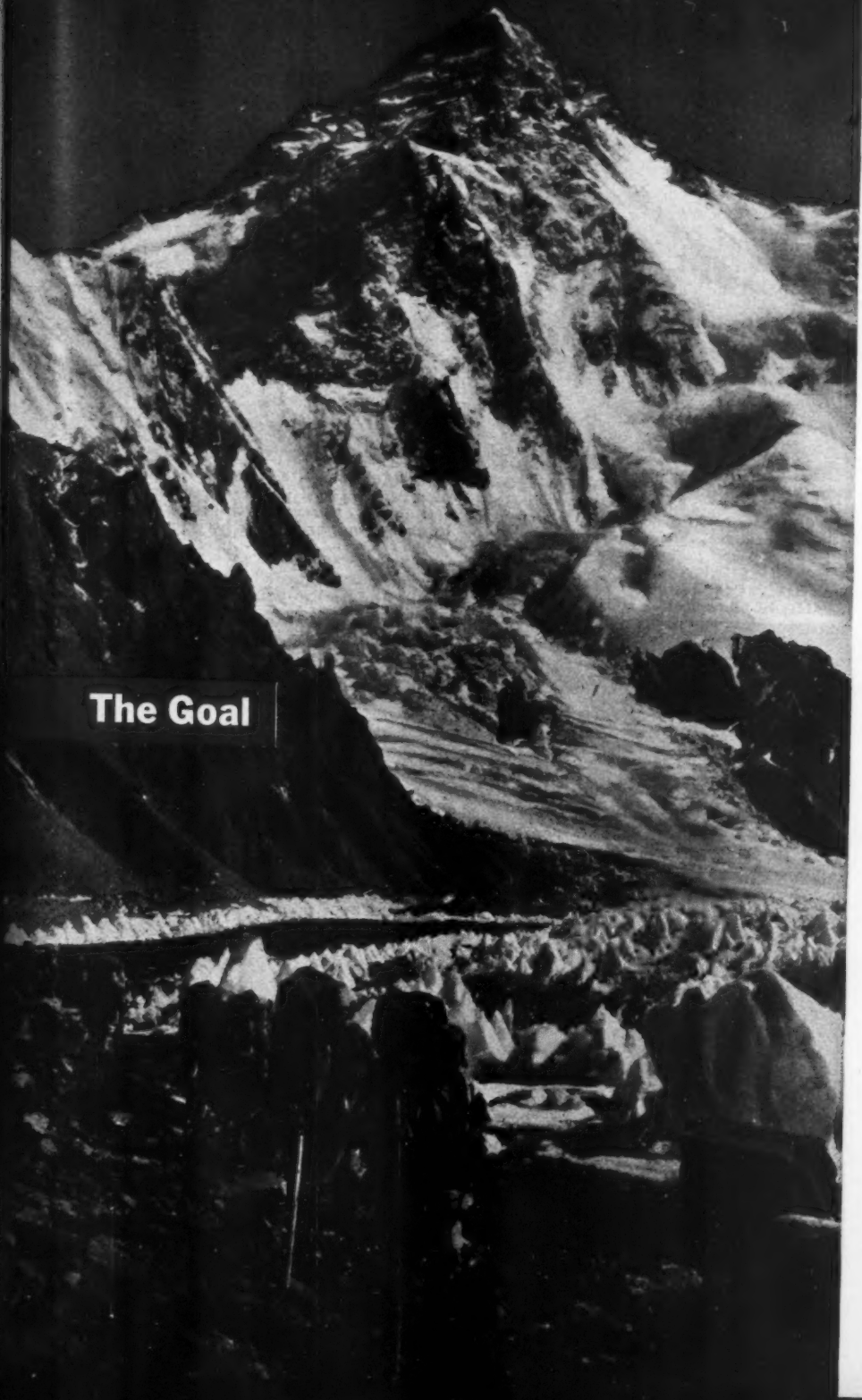
The eight men met in May and laid their plans. In June they would march to K-2. They would have July to try for the summit. They would return home in August.

For years, mountaineers called K-2

The Man | **The Place**

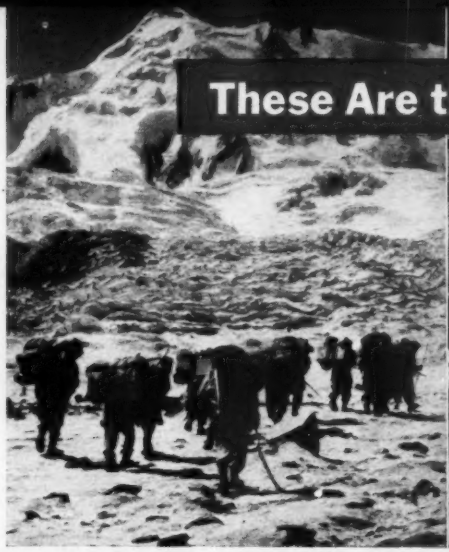


DR. CHARLES HOUSTON, 39, is America's No. 1 Himalayan climber. Picture shows him on only U.S. expedition to Mt. Everest area. Map and photo at far right show his current goal, also called K-2, 1,000 miles northwest of Everest and nearby Annapurna, loftiest peak scaled in past years. K-2 is located in a wilderness so remote that few have seen it.

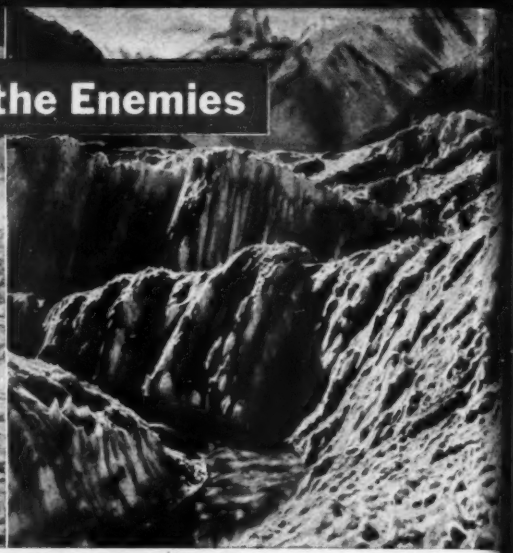


The Goal

These Are the Enemies



THE ROUTE IN: K-2 is twice as far from civilization as Everest. Everything must be carried on men's backs over 175 miles of rough ground, rock, ice. Speed: nine miles a day.



MOUNTAIN TORRENTS: Water from snow fields pitches downward in July between walls of rotting ice. Roaring rivers must be crossed by rafts, rope bridges or breeches buoy.

CRUMBLING ROCK: The pyramid that caps K-2 has sides of black rock so rotten that it splinters under a climber's boot and comes off in tufts as he tries to grab a handhold.

THE GLACIERS: They are the largest on earth, outside the poles. Their gullies "looked insignificant," said report of Houston's first K-2 trip—"although we did not find them so."

FEW CAMPSITES: Level spots are scarce on K-2. Most campsites must be hacked out of hard snow, ice, rock. This one is 4,000 feet above glaciers. Higher camps are even smaller.

"unclimbable." Then in 1938 a third-year U. S. medical student named Charles Houston almost got to the top. Charles Houston, now 39 and a small-town (Exeter, N. H.) doctor, is the leader of this year's expedition.

Also along is Robert Bates of Exeter, the only other veteran of the 1938 trip to K-2, and Arthur Gilkey, the Columbia University glacier expert. The Englishman is H. R. A. Streather of Warminster. The others are among the best U. S. mountain climbers, with long experience in the Alps, Rockies, Alaska and elsewhere: George R. Bell of Los Alamos, N. M.; Robert W. Craig and Dee Molenaar of Colorado Springs, Colo.; and Peter Schoening of Seattle, Wash.

K-2 Wasn't Found Until 1861

"Something hidden," Kipling wrote. *"Something lost."*

K-2 is so lost that, despite its towering height, it wasn't even discovered until 1861. What hides K-2 and its neighbors is a vast icy wilderness crossed and recrossed by dozens of mountain ranges.

There is no food for man or beast along the trail. All food and equipment must be carried on men's backs, step after weary step, over pathless ground.

"Behind the Ranges," wrote Kipling, pointing the way.

Over the ranges, through the cold wilderness, the U. S. party headed for a knot-point of Asia: a spot in northernmost Pakistan near the boundaries of five other nations (China, Russia, India, Tibet, Afghanistan), which makes a good jumping-off place for the assault on the Karakoram Mountains. The Karakorams, home of K (for Karakoram)-2, extend across the Indian state of Kashmir, and are a higher range—so far as average mountain height is concerned—than even the nearby Himalayas (which contain Everest).

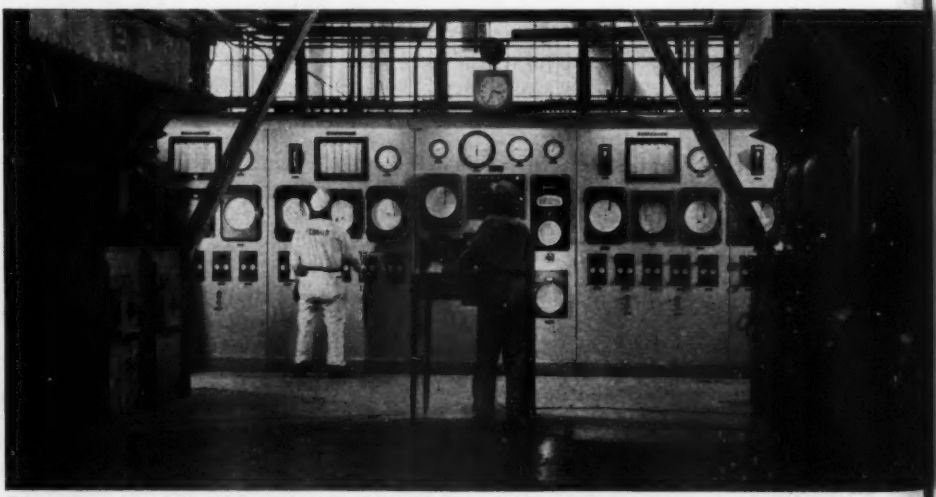
K-2, at 28,250 feet high, only 750-odd feet lower than Everest, rises right out of this astounding group of supereminent peaks: the tallest mountain of the tallest range on earth.

"Go!" commanded Kipling.

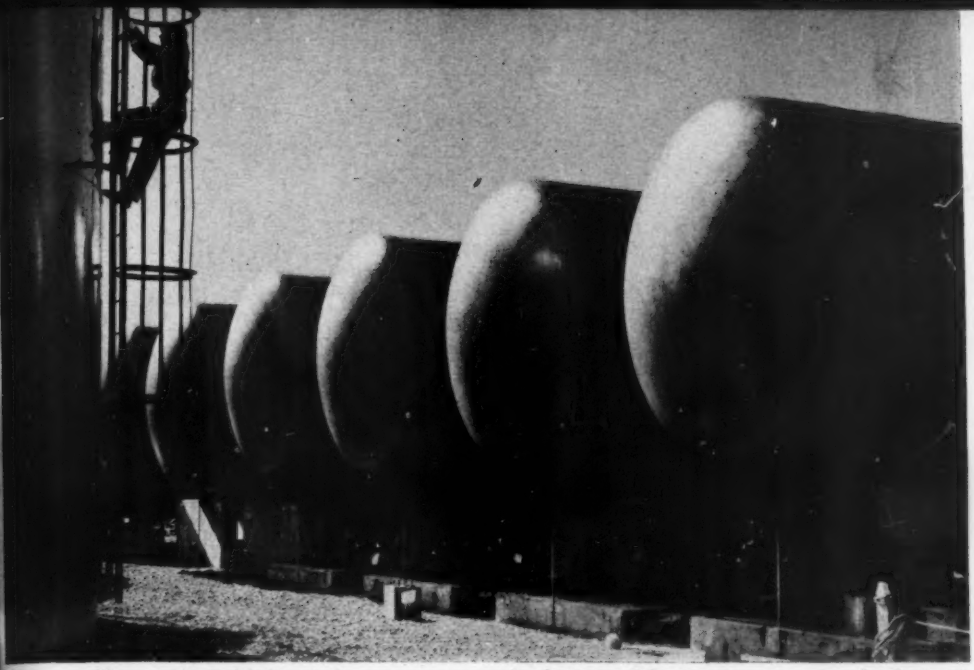
When a mountaineer finds a route he can climb, he says it will "go," and he says he can "go." As the Americans this month try to go up K-2, they will face

[*Continued on page 206*]

Rolling mill, already operating, turns uranium ingots into bars for making fuel "slugs."



Operators at one of mill's control panels will keep tabs on boilers and processing equipment.



Huge tanks hold chemicals to treat ores, and solutions of the uranium compounds obtained.

New Mill Rolls Out Uranium

ORE from uranium mines will enter a $78,000,000 mill, nearing completion for the Atomic Energy Commission at Fernald, Ohio—and out will come uranium metal, highly purified and rolled into bars and "slugs." The product will serve as fuel for great atomic piles like those of Savannah River, near Augusta, Ga., and Hanford, Wash.—and, also, as the material from which fissionable U-235, suitable for "fast-reactor" fuel or for A-bombs, will be extracted in gaseous-diffusion separation plants at Oak Ridge, Tenn., and Paducah, Ky.

Official name of the Fernald mill is the Feed Materials Production Center, FMPC for short. It combines the functions of a smelter and a metal-shaping plant, using equipment that includes "a precision mill especially for rolling ingots into bars in production quantities." Intermediate products of its operations will be "orange oxide" and "green salt," the oxide and fluoride compounds of uranium from which the metal itself is finally won.

"SLUGS" OF URANIUM from mill, in aluminum cans, will fuel atomic piles as above.

REPORT FROM THE

DRIVER'S SEAT...

Studillac, packing 210 hp., cuts around Cadillac to demonstrate pickup.

Studebaker with

Bill Frick's newest hybrid looks as innocent as a kitten—but has the getaway of a scalded wildcat.

By Wilbur Shaw

BILL FRICK is a guy with a head of hair that won't stay combed and a knack for building cars—from stock parts—that go 125 miles an hour.

Frick is the father of the Studillac, newest of America's hybrid cars.

Frick's Studillacs look like Studebakers and behave like scalded wildcats. Under their sleek skins are Cadillac engines, Chevrolet rear-engine supports, Lincoln drive shafts, Mercury rear axles and brakes.

The first of these hybrids that came off Frick's "production line" was driven at a top of 125 miles per hour. He thinks that a carefully tuned one ought to reach 130. It would do even better if the engine could be wound up beyond 4,500 r.p.m. But around that speed the hydraulic valve lifters begin to "float."

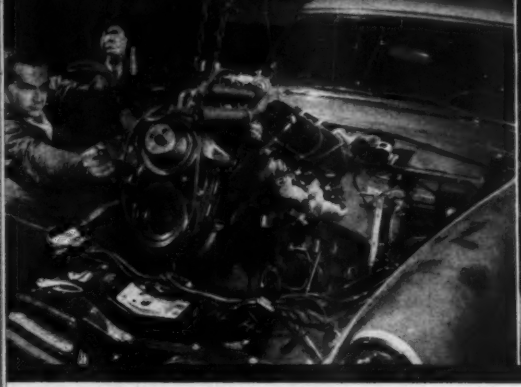
It will reach 80 m.p.h. from zero in 13½ seconds. Only twin exhausts show it's a hot rod.

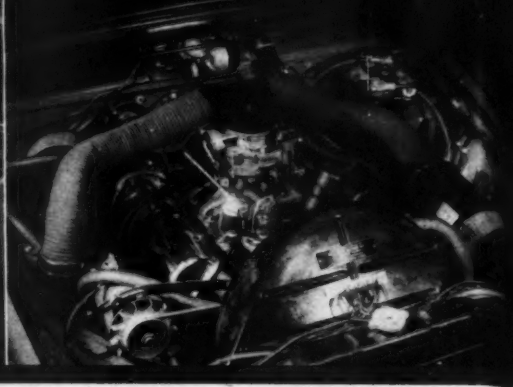
a Cadillac Engine

Frick was the first of a handful of men in this country who custom-build these hot numbers from standard automobile parts—instead of hopping-up cars by means of multiple carburetors, jumping camshafts and other applications of the hypodermic needle. He pioneered the Fordillac—a Ford with a Cadillac engine—and still builds them on special order.

The hypodermic car suffers from a permanent state of nerves. Frick's cars, by contrast, perform as beautifully at low speeds as at high. They look no different from other cars. Any woman with

FRICK is telling me he prefers the Cadillac to the Chrysler or Lincoln engine for Studebaker because of size. It measures only 33" by 33" by 26" without the bell housing.





TO MAKE a Studillac, you first pull out the Commander engine (left). From there on: install 1949 Cadillac front-engine supports (they're lower) and a 1948 Chevrolet rear-engine support; substitute a '49 Lincoln drive shaft, a Mercury rear end and brakes; build up a second exhaust system; make an adapter for two air cleaners; change control quadrant and accelerator linkages; and install the Caddy engine (right), with 90 more hp.

a sensitive accelerator toe can drive one to the grocery store.

Frick is a sort of Luther Burbank of mechanics.

I met him the other day when I drove out to Rockville Centre, Long Island, to take a turn at the wheel of a Studillac. It had that spanking-new European-style Studebaker body and a 1953 Cadillac engine of 210 horsepower.

The merest tap of the accelerator made the car quiver. When it took off at hard throttle, you were plastered against the back of your seat.

"If you want to have some fun," remarked Frick, "take a look at the faces of the Cadillac drivers as you go by them."

Their astonishment was excusable. In the heavy Cadillac sedan each horsepower in this engine toted almost 21 pounds of car. As a conventional Commander before conversion, the Studebaker V-8 carried 27 pounds per horsepower. In the Studillac the engine's load was only a little more than 16 pounds.

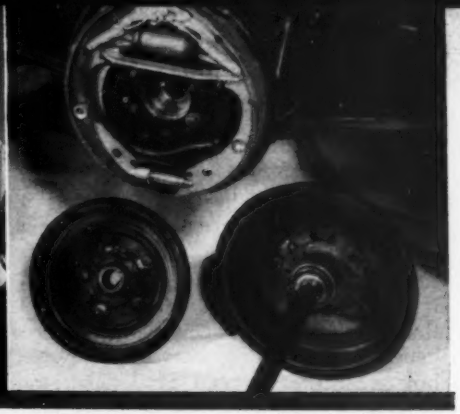
He Trims the Fat Off a Car

"What we do," explained Frick as the car touched 80 before I realized that the thing sizzled even at part throttle, "is simply cut the fat off a car. Put a big engine in a little car, and you've got performance."

He had *that,* all right. I couldn't say

WE PHOTOGRAPHED the new drive shaft and twin mufflers with the Studillac up on a hoist. The Commander's 3.54:1 rear axle has been replaced with a Mercury 3.31:1 axle.

TEMPLATES, like this one for an exhaust-pipe bracket, help Frick speed up conversion. The Caddy engine fits snugly. The crankshaft pulley misses the center steering-gear pivot by ¼". Steering column must be moved ⅜".



THIS WILL give you an idea of what Frick means about more braking area. At the top are the new shoes, at the lower left the old drum and (right) the new drum. Eventually Studillacs will have Caddy front brakes.

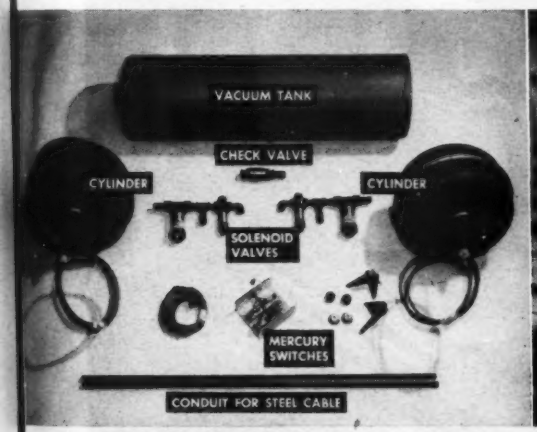
much for the braking, though. That much acceleration, that speed, called for faster stopping. Frick agreed.

"Imagine!" he said. "Nine-inch drums on this job. I'm going to give it 11-inch Mercury brakes and later put Cadillac brakes on the front. Caddy drums have the same circumference as the Mercury's but they're a half-inch wider."

The Studillac had another basic fault. With the spectacular acceleration, I found that the steering ratio was too slow for really safe driving.

Frick makes these cars on order. If you come to him with nothing (except money), the cost of a '53 Commander fitted with a new '53 Caddy engine comes to around $4,500 or $5,000—more if you want the works. But if you drive in your own '53 Studie, and don't want fancy extras like wire wheels, Frick charges $1,700 for the engine and conversion.

He buys the engines directly from the factory. They are strictly stock. His first conversion took him 140 man-hours of



FOR $250 EXTRA, Frick will install this Curve Master to keep your Studillac from heeling on a hard turn. It works by pulling down the front spring that would otherwise hike up—left side on a left turn, right on a right.

Manifold vacuum, valved to the proper cylinder by a mercury switch tripped by centrifugal force, does the job. Cables (arrow) are linked to piston in vacuum cylinder mounted above. Result: almost no lean on a curve.

work. He expects to have Studillacs rolling out of his place in 40 man-hours soon.

Some of the modifications I assumed he would make he doesn't make at all. The Caddy engine puts 100 more pounds of weight on the front wheels but it doesn't stiffen up the steering. He doesn't beef up the springs. The Studebaker radiator cools the engine all right except if it idles for prolonged periods. He uses the standard Caddy engine accessories—generator, fuel pump, starter and so on—but substitutes a twin Studebaker air cleaner so the engine will fit under that low hood. (It clears by a quarter of an inch.)

Disposes of Engines Easily

Frick has no trouble disposing of the Commander V-8 engines he acquires in the process of his conversions. He either sells them outright or installs them in other cars he has for sale. He is looking forward to getting some Siata chassis from Italy that are specifically designed to take the Commander engine.

Business must be good. He had orders enough last spring to keep him busy into midsummer—turning out a car each week—and they were still rolling in.

The Bill Fricks of the motor world are a breed unto themselves. They were born with mitts that fit wrenches. They were weaned on gasoline. To them, cars are pulsing, living things. They wince when they see a motorist abuse an engine. To them, remembering what will fit what is as natural as breathing.

Frick completely ignored the problem of a drive shaft for the Studillac till the conversion was almost complete. Then he crawled under the car with a steel tape. He came out looking thoughtful.

"Send me," he told a Lincoln dealer on the telephone, "a drive shaft for a 1949 Lincoln Cosmopolitan with Hydra-Matic." It fitted.

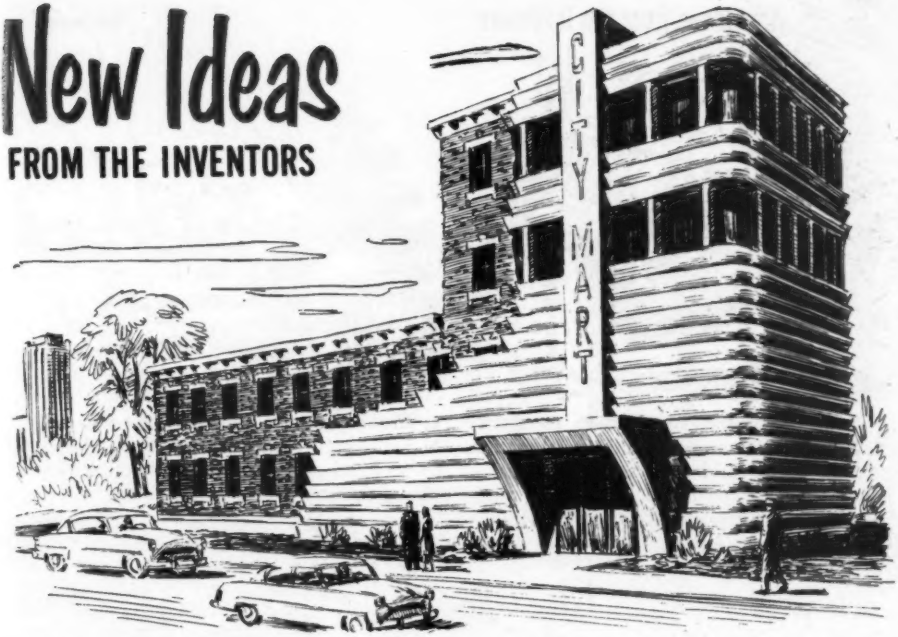
Yet Frick can't remember his home telephone number. Every time he calls there he has to look it up.

Frick is 36. He began hanging around a garage near his home when he was 14. To keep from getting shooed out, he ran errands for the mechanics. At 15 he was a Saturday apprentice. From then on, his

[*Continued on page 210*]

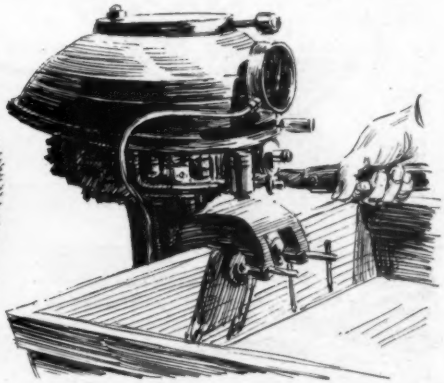
CONCRETE FIXTURE helps in welding up the new tailpipe, assures the bends will be just right. Finished Studillac weighs 3,425 pounds, only 150 more than Studebaker.

New Ideas
FROM THE INVENTORS



1 False Front to Modernize Building. Putting a new face on an old building—or on a group of dissimilar buildings in a block—would be simple, quick and inexpensive if done this way. Metal arms bolted to the front of the structure would support a façade of horizontal strips arranged in a modern architectural style. Standing off from the building the angled strips would admit light and air to hidden windows.

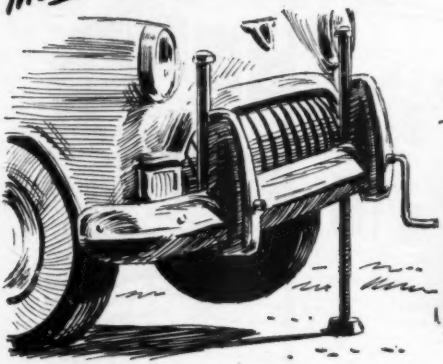
2 Bike Light to Signal Turns. Directional signals and running lights in the handle bars of a bicycle would make night riding easier for a cyclist and for any motorist behind him. The lights of course would face to the rear. An assembly comprising the lights, a thumb switch, battery carrier and hand grip would slip into handle bar.



3 Gauge to Clock Outboard Speed. Water pressure would work the needle on this outboard-motor speedometer. The intake tube would open in the direction of the boat's motion. It would be separated from the propeller so the prop's turbulence would not affect the amount of water being piped up to the pressure-sensitive gauge.

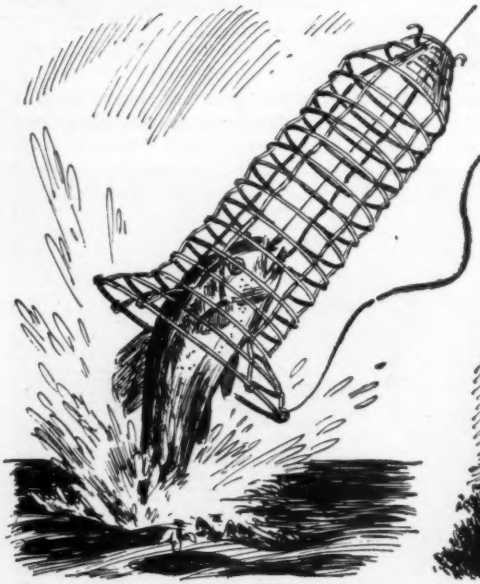
Please turn the page for more new ideas.

MORE New Ideas from the Inventors



4 Bumper Guard to Double as Jack. The hollow casing of this combination bumper guard and jack would contain a jackscrew mechanism. Jackshaft and crank handle would be carried separately, could be inserted any time the car needed a lift.

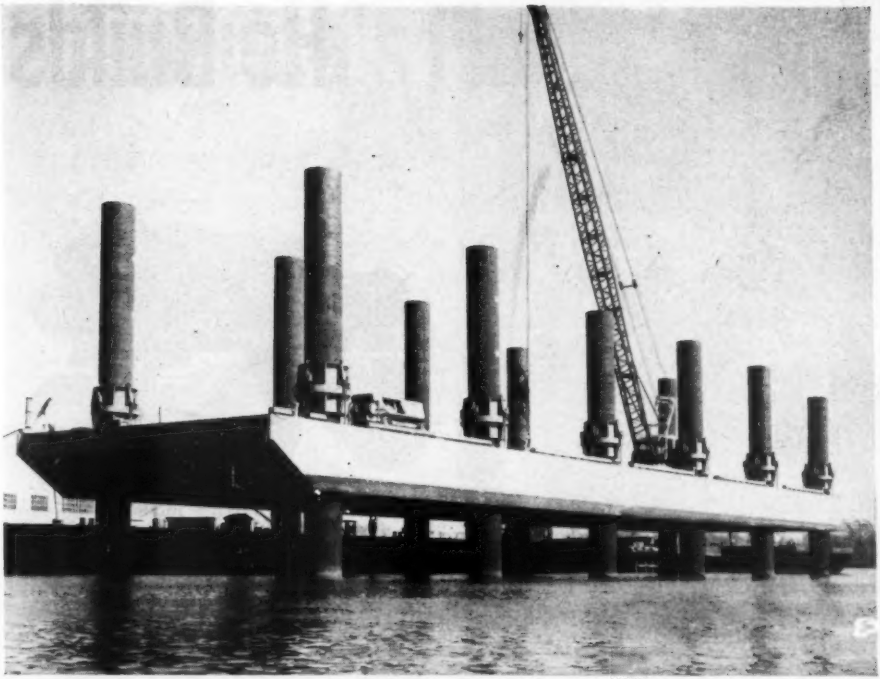
5 Electric Tool to Pluck Weeds. This lightweight garden accessory is intended to be hand-carried. The user would simply place the head over a weed patch. Rotating toothed disks, driven by a high-speed electric motor, would do the rest.



6 Net to Cage Hooked Fish. The big ones wouldn't often get away if you had a net like this on your line. Fixed around the line, the cagelike net would be released by a tug on the hook. It would slide over the fish, make it easy for you to land him.

7 Golf Club to Have Two Heads. This one club, says its inventor, could take the place of a matched set. The balanced shaft would have the same "feel" from either end. The head not in use would be turned inward, out of the way.

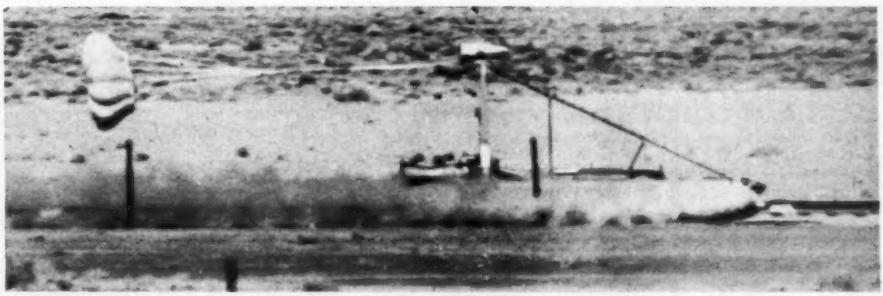
Patents on these inventions have been granted to: 1. R. W. Wood, Swarthmore, Pa.; 2. H. C. Schadel Jr., Corona, N. Y.; 3. E. C. Kiekhaefer, Cedarburg, Wis.; 4. F. Brown, Tampa, Fla.; 5. W. C. Hands Jr., Rutherford, N. J.; 6. O. C. Richardson, Detroit; 7. H. H Murphy, Walpole, Mass.



Barge Turns Into Dock, Shinnies Up Tubes to Pier Height

THIS dock hauls itself up to pier height the way a boy shinnies up a tree. Air jacks climb the big caisson stilts, taking the hull up with them. The steel stilts—six feet across, 100 or more feet long—are set in position after the dock is floated to its site. They are dropped through wells and jacks set around the tops of the wells, and pile-driven through the sand bed to solid footing. Then the jacks go into action.

The dock was designed by Consolidated Western Steel for military use, offshore drilling and commercial operations. Some of the first barges are serving in Greenland.



World's Fastest "Railroad" Hits 1,500 M.P.H. to Test Chutes

THAT'S a rocket-powered sled above, zipping along steel rails at 1,500 miles an hour to test chutes and other equipment for jet planes. It hits this peak speed in 4½ seconds, but in that time it travels 5,500 feet. About $100 worth of alcohol-oxygen fuel is used for each 10,000-foot run. A scoop dips into a trough of water between the rails to bring the sled to a stop in about 300 feet. The Cook Research Laboratories created it.

He Builds

IVAN COLLINS and wife stand beside old wheel which he copied in miniature to make wagon replicas shown on these pages. During an exhibit of his models, 3,000 visitors came to Collins' farm near Springfield, Ore.

LOGGING WAGON like this model carried timber out of the thick forests of the Pacific Northwest in frontier days. Oak pegs were pounded into the wheels for strength.

STAGECOACH above rumbled over early U.S. highways. It was patterned after a heavy British vehicle that took vacationers to a seaside resort in Brighton, England.

BREWERY WAGON has 16 tiny beer kegs that Collins painstakingly built. He used a medicine dropper to fill each of the two-ounce barrels with genuine brew.

America's Finest Wagons

Prairie schooner, brewery wagon, or surrey with the fringe on top—each little replica takes 600 hours' work.

By Richard L. Neuberger

SOME folks thrill to the sight of a diesel-electric locomotive, giving its all to hoist tonnage over a mountain. Others get misty-eyed when they glimpse an ocean liner standing majestically out to sea. Then there is that numerous breed which looks upon a gleaming convertible as one of earth's grandest spectacles.

But a bushy-haired, 47-year-old mechanical designer named Ivan Linus Collins feels his pulse slipping into high gear whenever he stumbles upon an ancient, dilapidated wagon.

The older and crustier the wagon, the more do Collins' well-thatched temples throb with excitement. In his back pocket he invariably carries a carpenter's folding rule, to be used in measuring from tonneau to tongue any animal-

The Conestoga wagon, rugged grandsire of all American wagons, was built as early as 1725.

U.S. presidents saw the canyons and geysers of Yellowstone National Park from this coach.

drawn contraption which looms into view.

Collins, who lives along the foaming reaches of the trout-filled McKenzie River near Springfield, Ore., is a man with a single burning purpose. That purpose is to create authentic models of the vast assortment of vehicles which moved Americans and their belongings during the long years that preceded full development of rail and motor-car transportation on this continent.

SURREY WITH THE FRINGE ON TOP was a light, fast vehicle for driving the family around. Canopy protected the occupants of the carriage from hot summer sun.

It often takes Collins a week to inch across a rural county. This is because he pokes around behind barns and crumbling livery stables in quest of drays and carriages which were left stranded when horses gave way to horsepower.

Only Builder of Wagon Replicas in U.S.

"Thousands of people are making miniatures of old trains, pioneer airplanes and the first steamboats and river packets," explains Collins. "The automobile manufacturers are immortalizing their own early products. But I believe I'm just about the only person in the United States who is trying to preserve exact and accurate copies of wagons."

During the past 18 years Collins has built precise replicas of 46 different horse-drawn vehicles which once were fairly commonplace. His ultimate goal is at least 100. Lest this seem a modest

Oxen or mules furnished "horsepower" for pulling a freight wagon over Western plains.

ambition, it should be noted that a minimum of 600 hours of painstaking effort must be spent on each of Collins' models. For example, nine separate coats of paint are par for the course when he is giving a wagon its gleaming finish.

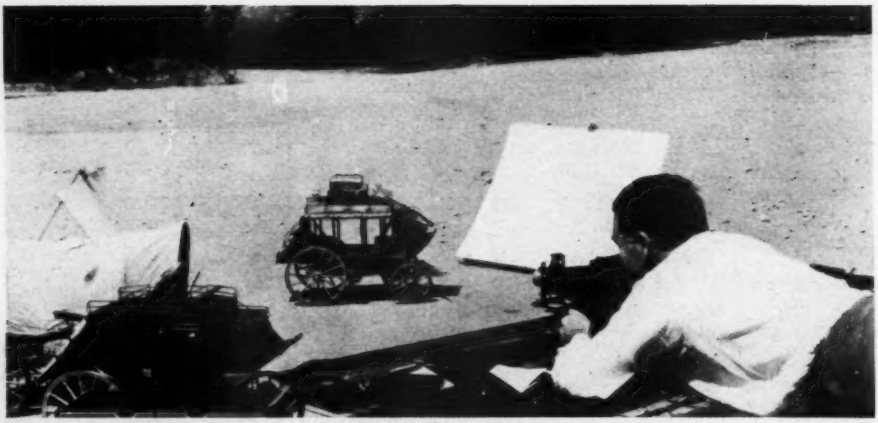
Collins abandoned his job as a model-builder at Lockheed Aircraft in California and returned to his native state five years ago, just so he could spend more time on his wagons. He now designs mechanical equipment for the University of Oregon, but the five o'clock whistle merely starts him on an eight-hour swing shift in his compact wheelwright's shop at home.

The models emerging from this shop are one-eighth the size of the original wagons from which they have been copied. Every separate item is built to scale, even lanterns and springs and buggy whips. In over-all bulk, a miniature van built by Collins matches the general proportions of a portable radio set.

Furthermore, everything works—the springs bounce, doors open and shut, tops fold back smoothly, blankets the size of a dollar bill fold neatly into cutter seats, the fringe of the surrey flutters if a bystander breathes upon it.

Collins is a hairsplitter for accuracy. In the strongbox of his stagecoach, he insisted on depositing genuine gold dust, flushed laboriously from an Oregon

THIS HOTEL OMNIBUS picked up passengers from frontier trains. Collins painted postage-stamp-size oil paintings on the inside of this coach model.



TO PHOTOGRAPH the model above, Collins places it 75 feet from a woods background, then shoots it from a distance of three feet. He uses a 59-year-old camera.

creek bed near Springfield. Into the upholstery of the carriages, he and his blonde wife Laura wove identically as many threads per square inch as were used in the real vehicles. For the fire engine Laura knotted a rope life net, smaller than their two-year-old daughter's handkerchief, but of just the right mesh.

One of Collins' favorite miniatures is a replica of the oblong, top-heavy wagon which generated gas for the first daredevil observation balloons, during the Civil War. His foot-long model actually will produce hydrogen gas. All he has to do is add hydrochloric acid to the iron filings and water in the tanks of the little vehicle.

Collins has taught himself to become an expert draftsman, metal worker, blacksmith, wheelwright, wood carver, upholsterer and leather tooler. He thought this comprised the works—until he found the Umatilla House omnibus behind a commercial garage along the upper Columbia River. Then he had to be a landscape painter.

Old Carriage Reflects Past Glory

The first Union Pacific trains on the twisting Oregon short line were met by a gaudy, high-wheeled carriage, which took weary travelers to the Umatilla House, where there were chicken dinners, champagne suppers and elegant ladies. When Collins discovered the crumbling omnibus, the glory was departed. The mud of generations clung to it like frosting to a cake. But he still could tell that inside the dashing vehicle, over the windows, there had been different Pacific Northwest scenes in oils.

Collins' passion for detail forced him

COLLINS MEASURES an original wagon below, then makes plans with drawing instruments.

to paint a panel of tiny landscapes of Mount Hood, the Columbia Gorge and other natural wonders.

Yet he waves aside airily any tendency to marvel at his persistence. "I've got to be exact," says Collins, with the zeal of a man with a mission. "Other model-makers act as a check on each other because they're working in the same general categories of transportation. But, so far as I know, I have no competitors."

This spring the Stanford University Press, which usually features the works of erudite scientists and scholars, published a book of photographs of Collins' wagons. The title is "Horse Power Days."

Taking pictures of the models is an art in itself. Collins places the wagon from three to five feet away from the camera lens. At least 75 feet behind the vehicle hovers an appropriate background—Oregon trees for a logging wagon, Idaho desert for a stagecoach, bridge piers for an Army munitions van, a railroad station for an express wagon, a park plaza for a stately victoria.

The wagon is in sharp focus, the background is blurred. Yet the tiny vehicle, a foot in length, seems perfectly matched with the distant firs, 175 feet high. A miniature dray and a huge warehouse synchronize harmoniously.

After experimenting with many cameras, Collins finally settled on a Bausch & Lomb Ray No. 7 which his uncle had purchased in Seattle in 1894. Its ancient lens can be stopped to a pinhole outlet. It was what Collins sought to capture the detail of his miniatures.

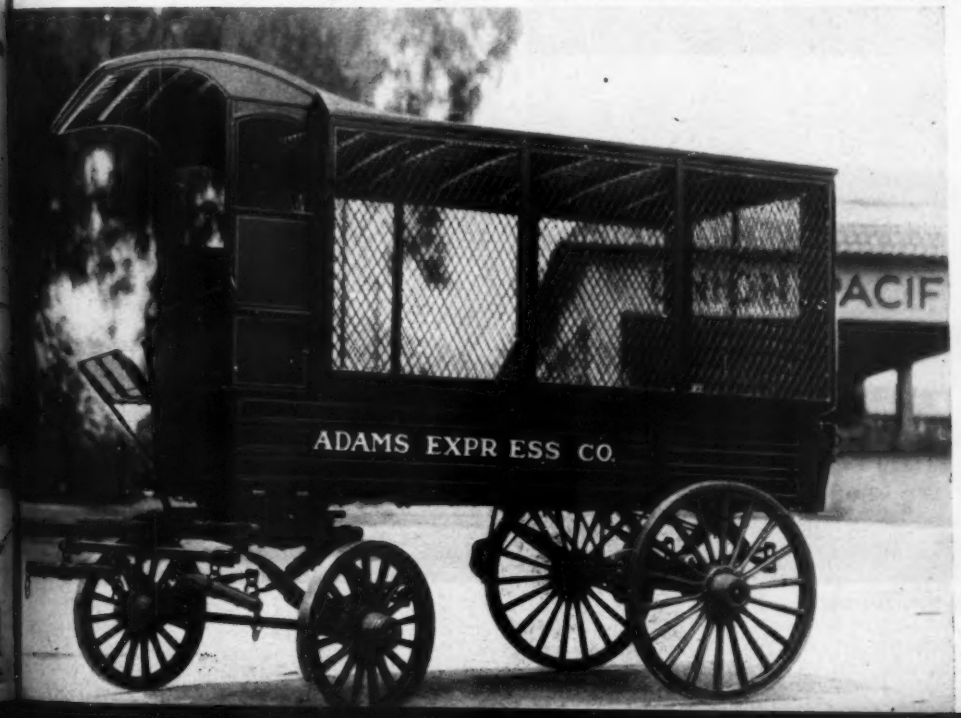
"Besides," he confesses, "it made me feel in keeping with the whole project to be able to photograph models of old vehicles with an old camera. I guess I just didn't want anything streamlined about this undertaking—not even the camera!"

Doctor Suggested Model Building

Collins was in bed with an ulcer in 1935 when the doctor counseled some form of handicraft as a means of relieving nervous tension. The physician himself suggested a prairie-schooner kit for Collins to assemble.

[*Continued on page 198*]

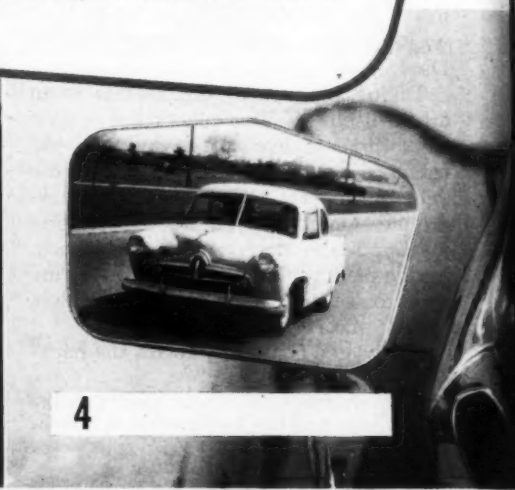
EXPRESS-WAGON photo shows how skillfully Collins uses real-life background in photographing his miniatures. An actual Union Pacific Railroad station is behind the model.



What's Passing You Now?

You're pretty good at identifying the cars you meet on the highway. But it's a little harder to tick off the ones that you glimpse only in your rear-view mirror as they creep up from behind to pass. See how many of these cars, old and new, you can recognize that way in the pictures on these pages. Then check with the answers printed upside down at the bottom.

3



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7

8

7. Be Swift B. Hillman Minx 8. Crosley 10. Oldsmobile.

Answers: 1. Lincoln; 2. Hudson; 3. Mercury; 4. Henry J; 5. Nash Rambler; 6. Packard;

I'd Like to see them make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

INSTRUMENT DIALS in airliner cabins, so that passengers could tell the speed, altitude and direction they were flying.—*Samuel Harris, Huntington, N.Y.*

A REPEATING SPRING GUN for shooting newspapers up front walks. It would save lots of steps for newsboys with long routes.—*Wm. Campbell, Bakersfield, Calif.*

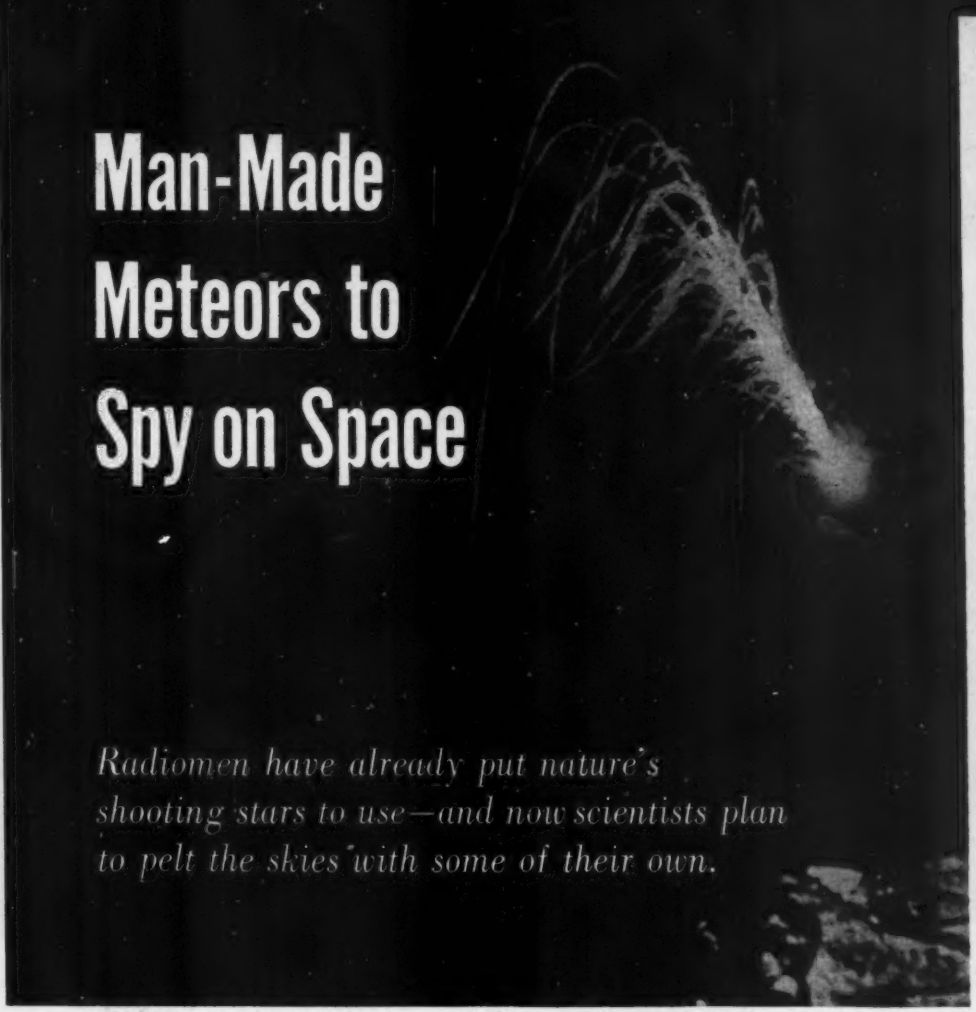
FAUCETS WITH WASHER SIZE stamped on the exterior so you wouldn't have to turn off the water to check diameter before buying a replacement.—*C. B. Bailey, Puyallup, Wash.*

SPRAY-ON RUBBERS of liquid plastic that would dry to a hard, waterproof film but could be peeled off the leather when the streets dried.—*R. E. West, Lyndhurst, N.J.*

A LOW-WATT HEADLAMP wired across the fuse terminal of a car. It would give some light if a fuse blew during a night drive.—*S. Ramya, Panadure, Ceylon.*

Man-Made Meteors to Spy on Space

Radiomen have already put nature's shooting stars to use—and now scientists plan to pelt the skies with some of their own.



Set off in air, shaped charge gives artificial meteor shower at White Sands Proving Ground.

By Edward Hutchings Jr. and Olin J. Eggen

DESPITE the promise of spaceships and guided missiles, the first man-made thing to sail out into interplanetary space will probably be a meteor.

Long before the first passenger-carrying rocket ship takes off, artificial meteors may go out as scouts. To overcome the earth's gravitational pull and escape into outer space, you must attain a speed of almost seven miles a second. The fastest rocket tested to date has gone about 1½ miles a second. But man-made meteors already have reached speeds close to seven miles a second.

By firing these artificial meteors from high-flying rockets or balloons, it should be possible to project them into satellite orbits of the earth, so that they would circle the globe, as the moon does—or send them out into interplanetary space, never to return.

Like the genuine article, an artificial meteor is basically very simple. One of the easiest ways to produce one is to fire a chunk of metal from a shaped explosive

charge. This gives almost incredible speed. Friction with the air makes them incandescent, like real meteors.

Meteors are the only tangible substances that reach the earth now from outer space; more than a billion of them enter the earth's atmosphere every day. They travel at an average speed of about 30 miles a second. That's faster than any of the present-day classifications of missile speeds, like supersonic or hypersonic; so scientists have invented a new classification to describe it—ultra-flight.

When they plunge into the earth's atmosphere, these fast-flying chunks of stone or metal encounter air resistance for the first time, and trails of hot gas form in their wakes. This incandescent gas—and not the meteor itself—is what we see as a shooting star or a fireball. (A fireball, as one astronomer defines it, is nothing more than a meteor bright enough to cause people to report it.)

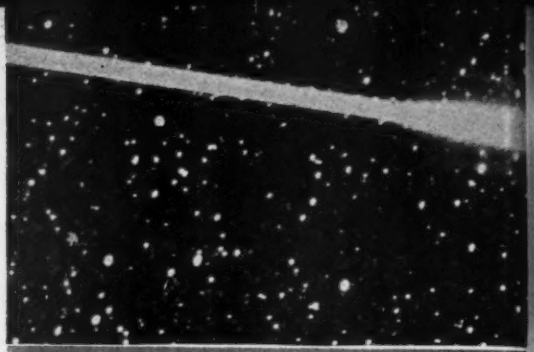
5,000 Hit Earth Yearly

Usually meteors appear at a height of about 60 miles and burn out by the time they are down to 40 miles. Occasionally, a fireball will plunge to less than 10 miles above earth and then explode with a rumble heard 200 miles away.

Most meteors are no bigger than a grain of sand. Every year, though, there are about 5,000 meteors large enough to pass through the atmosphere without burning completely. After they fall to the ground we give them a new name—meteorites. About five tons of meteorites—and dust from burned-out meteors—fall to the ground every day.

Fortunately, not many are as big as one that landed in Russia 45 years ago.

Illevitch Ilyinsky, stationmaster at the city of Tansk, on the Trans-Siberian Railroad, was waiting for freight train No. 92 to come in from Tomsk. It was a bright June morning and Illevitch noted that it was just seven o'clock as the train appeared around the bend. Suddenly the air was split with a tremendous roar. The ground shook violently. The engine was thrown from the rails and Illevitch was knocked off his feet.

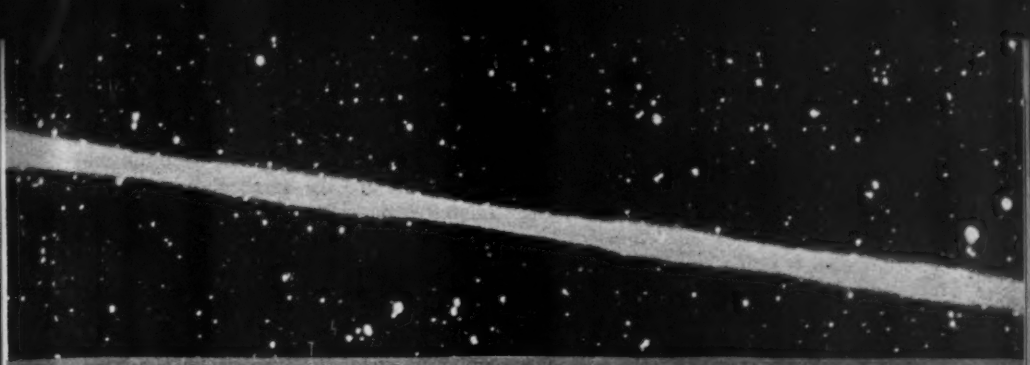


BRIGHT TRAIL OF METEOR was caught while photographing an extragalactic nebula with aid

RADIO ECHOES from 70-mile-high meteors are studied with camera and oscillograph by Drs. O. G. Villard Jr., and Allen M. Peterson in Stanford's Radio Propagation Laboratory.

Five hundred miles to the north, at the hamlet of Kovinsk, a herd of more than a thousand reindeer was burned to death by the heat of a tremendous explosion. Thousands of acres of virgin forest were blown down by the concussion, and the earth tremors were recorded as far away as London.

This was in 1908, not 1953, and the cause of the destruction was more powerful than five Nagasaki-type atomic bombs. This was a heavenly bomb—a meteor composed of 5,000 tons of solid iron. If it had struck just four hours and 47 minutes later, the earth would have turned enough to have brought the city of Leningrad into position, and the force of the impact would have completely wiped out the city.



of a great astronomical telescope. When a meteor enters the earth's atmosphere, it makes both a streak of light and a trail of ionized particles producing radio echoes.

PUTTING METEORS TO USE, radio amateurs now bounce signals off their trails. This maintains communication between stations 700 to 1,000 miles apart whenever conventional path, by reflection of radio waves from ionosphere, goes dead. There are enough meteors, and trails last long enough, for continuous transmission of code messages.

This Siberian meteorite left nearly 100 holes spread over several miles of land. At rare intervals, the earth encounters a meteor of sufficient size to blast a hole in the ground such as the great crater at Canyon Diablo, in Arizona. This 4,000-foot-wide hole was probably formed about 50,000 years ago when a 1,000-ton ball of fire plowed into the Arizona countryside, scattering its fragments over many acres.

There are about a dozen other large meteor craters scattered over the world. The largest may well be the two-mile-wide Chubb Crater in northwest Quebec, discovered in 1951. In Australia there is a group of 13 craters, from 30 feet to 275 feet in diameter. The meteorite that was responsible for them obviously fell a long time ago; trees over 500 years old are growing in the craters today.

Most meteor research to date has been done with telescopes and cameras—like the meteor traps set up by the Harvard Observatory in 1936. Two wide-angle cameras, 25 miles apart, kept watch on a section of the sky. Each photographed every meteor that flashed through the area. By comparing its position on the plates from the two cameras, it was possible to determine its height. By equipping one camera with a rotating shutter, so that meteor trails were recorded as broken lines, it was possible to determine a meteor's speed as well as its path. The cameras caught few meteors though—maybe a dozen a year.

Today, a powerful and efficient new

tool has taken over this job—the Super-Schmidt Meteor Camera. A 5,000-pound camera, specially designed for photographing meteors, it covers 1/10 of the visible sky at a time and traps 40 times as many meteors as the old cameras did.

Radar also is being used to track meteors today, giving a sizable boost to meteor research. Radar makes it possible to study daytime meteor showers for the first time. It distinguishes single meteors from groups; it discovers particles too small to be caught by cameras; and it works in all kinds of weather.

Ionized Trails Echo Radar Beams

This research is adding to our understanding of the upper atmosphere, too. When a meteor enters the atmosphere, it leaves a trail of electrons behind it as well as a streak of glowing gas. Radar echoes from these ionized trails are giving us information about such things as wind motions in the atmosphere, and facts about the ionosphere—the region from 40 to 60 miles above the earth which reflects short-wave radio waves back to us.

Radio hams are even putting the meteor trails to practical use. When transmission by other paths fails, communication can be maintained by bouncing signals off the trails of meteors. This has been demonstrated in nighttime experiments by two amateur radio operators of Stanford, Calif., Drs. Oswald G. Villard Jr., and Allen M. Peterson. Enough meteors bombard the earth, they report, to crisscross the upper atmosphere constantly with a reflecting fabric of ionized trails, from which signals of favorable wave length echo back to earth and afford uninterrupted contact between stations several hundred miles apart. For an 800-mile distance, a relatively low frequency of 14 megacycles was found best.

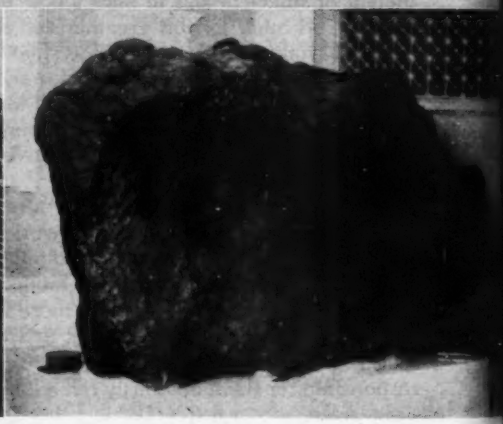
But meteor research is still comparatively slow and difficult. Scientists still lack a good deal of fundamental data on meteors and they still need a lot more physical observations. This is where artificial meteors come in. True meteors come at random and they're hard to catch. By shooting off man-made meteors we can make visual and photographic observations at will.

The artificial meteor project is being most actively pursued today by Dr. Fritz Zwicky, professor of astrophysics at the California Institute of Technology, and chief research consultant for the Aerojet Engineering Corporation of Azusa, Calif.

In ground experiments, most artificial meteors burn up because of air friction by the time they have traveled about 100 yards. With increasing height and decreasing air density, the tracks of arti-

FOREST IN SIBERIA was leveled by blast, not of an atomic bomb, but of a gigantic meteorite that fell nearby in 1908. This photo shows scene as it looked 20 years later.

BIGGEST METEORITE in captivity is this 36½-ton specimen brought from Greenland by Admiral Peary. Only larger one known, of 60 tons, lies where it fell in South-West Africa.



ficial meteors become longer. Since Zwicky's experiments have already produced particles with speeds of almost seven miles a second near the ground, at altitudes of 20 miles or more the velocities of these particles should surpass the speed necessary to escape from the earth's gravitational pull.

Tries to Fire Meteors from Rocket

The only attempt so far to launch artificial meteors from great heights took place on Dec. 17, 1946. With the cooperation of Army Ordnance, Dr. Zwicky mounted six shaped charges in the nose of a V-2 rocket on the White Sands Proving Ground at Las Cruces, N. M. This was the first night firing of a V-2, and it was scheduled primarily to observe the six showers of artificial meteors to be ejected from the rocket—two at a time and in opposite directions.

The time schedule was carefully worked out. Seventy seconds after the rocket left the ground, at a probable height of 140,000 feet, two showers of meteors were to be ejected. Ten seconds later, when the rocket had reached a height of about 180,000 feet, two more showers were to shoot out. At 90 seconds and 220,000 feet, there was to be a final flare of meteors.

[*Continued on page 240*]

MOON'S CRATERS may be result of meteorite bombardment. Recent studies favor this over rival hypothesis that craters were of volcanic origin.

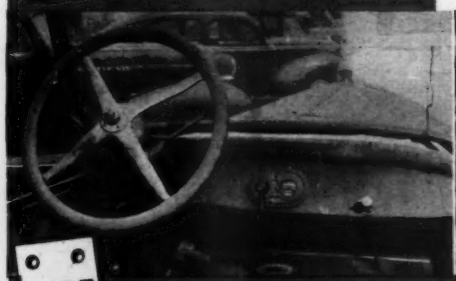
HUGE CRATER in Arizona, nearly a mile across, marks spot where it is believed one of history's greatest meteorites hit. Many tons of meteoric iron have been found nearby.

Once Upon a Time...

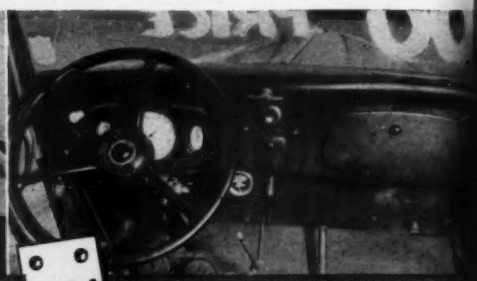
. . . a motorist had nothing to worry about but driving. Now the galaxy of dials, gauges, levers and buttons he faces would dazzle an airliner pilot. The evolution of dashboard complexity is traced here in photos reprinted from *Alumination*, a Kaiser Aluminum distributors' magazine.

1906 HOW SIMPLE can you get? It's either on or it's off.

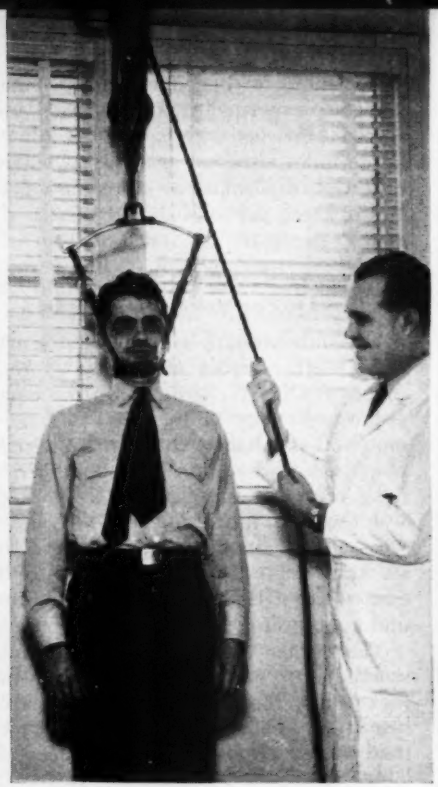
1923 HOW'S A MAN going to keep track of all these gadgets?



1927 NOW WE GOT a choke. But nothing to tell you how fast you're going.



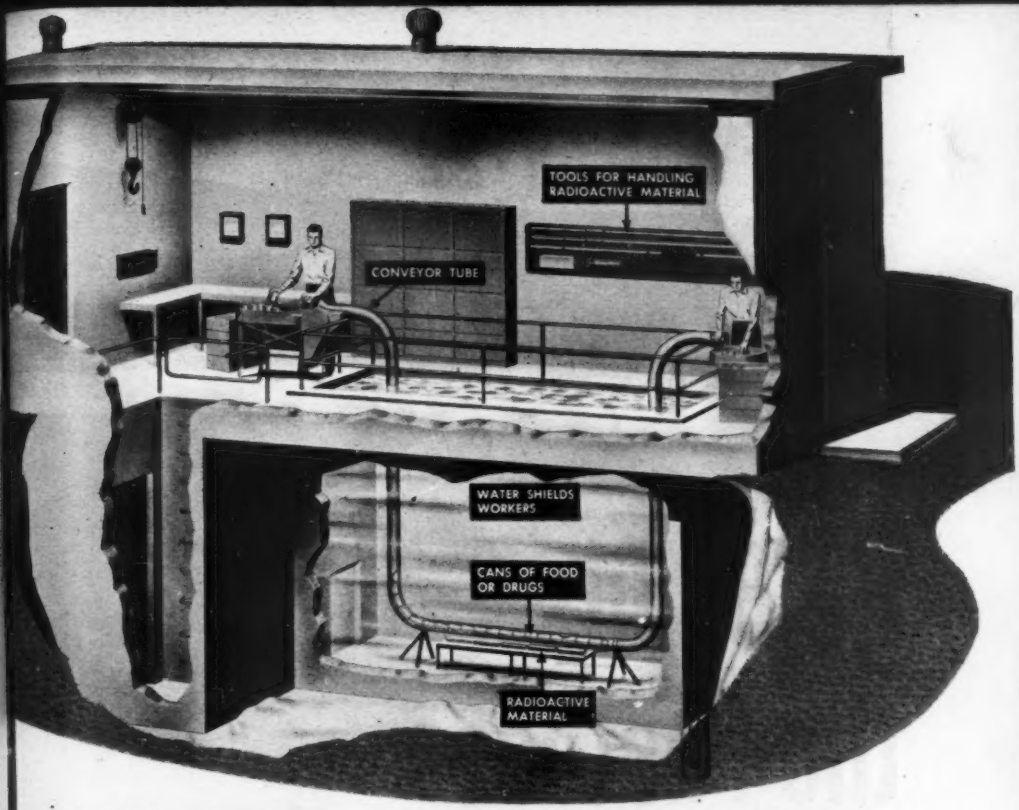
1934 AT LAST the little woman's got a place to lose her sunglasses.



Neck Stretcher Eases Backache

THE Air Force officer above is about to be strung up—for his health! A therapy that looks as if it might result in a pain in the neck, it's supposed to remove one. Traction eases neck- and backaches by relieving pressure. The patient puts his head in the noose daily for a 30-second treatment at Offutt AFB hospital in Nebraska.

Does the sight of old cars stir fond memories? See



Atomic Canning Preserves Food Without Heat, Protects Taste

ATOMIC rays are now being used to preserve food. Since no heat is used, as in ordinary canning, the irradiated food keeps its fresh flavor. The process works on drugs, meats and vegetables—uncooked hamburger, which usually spoils in a few days under ordinary refrigeration, has been kept palatable for two months.

Several atomic canneries, all experimental, are already in operation. One at Stanford Research Institute, Calif. (above) sends vials of penicillin through a U-shaped tube in a pool containing radioactive cobalt. At MIT, scientists working with the Navy use the electron beam from a Van de Graaff atom smasher to treat meats and vegetables.

AND A RADIO—flanked by dummy panels for, maybe, radar and TV.

PILOT TO COPILOT: When does a man find time to steer?

page 126 for details on how to win a Model T Ford.

In first water trials, Boat No. 6 lives up to wind-tunnel promise.

He Builds the Fastest Outboards

From garage to rowboats to racers—that's the story of Pop Willis, who has lost count of the records his sleek craft have broken.

By Fred Pass

WHEN a hundred or more curved slabs of mahogany go skimming across Lake Dallas, Tex., at the National Outboard Association's championship races next September, the chances are better than eight out of 10 that a boat built by S. C. "Pop" Willis will lead the pack.

So well have his speedlined racers performed at past meets that Pop Willis has lost count of the national and international trophies they have won. But he does know that more than 80 percent of the boats which race in the favorite

POP WILLIS works on a Comet. What the buyer gets is a hull 13 feet long, 51 inches wide, and weighing 200 pounds. It is constructed of Philippine mahogany and airplane spruce. Pop boasts that each piece of mahogany is free of blemishes. His Dallas, Tex., boat works turn out some 200 of these popular Class C race-winning boats a year.

C Class (boats powered by motors of 20 to 30 cubic-inch displacement) are made in his shop in Dallas.

Each year the Willis Boat Works turns out at least 200 Class C racing boats that go to all parts of the country and sell for $400. Never one to open the throttle on a racing outboard himself, Pop has gained immense pleasure, a measure of renown and fair profit by outwitting wind and water resistance.

Pop used to own a filling station and garage in Dallas. But because he loves the graceful lines of boats and gets a kick out of being around the vibrant, energetic fraternity of men who race

them, a hobby became his business.

It started during the depression days of the early 1930s. Pop had learned how to build fishing boats when a boy on the Cumberland River in Tennessee. With business slack, he cleared away a corner of his garage and built a boat with the intention of going fishing at a nearby lake. He got the boat to the lake, but before he could wet a hook, a man offered him $90 for the boat. He sold it.

Pop made more boats for friends, and because they were good boats, orders stacked up. Boatbuilding grew to more than a sideline. He moved to larger quarters and gave equal space to the garage and the boat works.

Develops Interest in Racing

One afternoon he was at work on a boat when a man came into the shop and said he owned a racing boat that needed repairs. Pop explained that he knew nothing about racing boats, but he would take a look. He must have done a good job, for other racing enthusiasts brought their boats to him when repairs were needed.

From this new work, his interest in racing developed. He would go and watch a race any Sunday there was one within driving distance of Dallas. He picked up some new ideas about boats and talked them over with a Sunday racing enthusiast named Jack Barbee. Barbee, whose main job was selling harvester machinery, was interested. The two men started working on a boat that would incorporate Pop's suggestions.

He and Barbee put in months of labor before the boat was finished. Then they took it to Dallas' White Rock Lake for testing. Barbee opened the throttle and the boat went crazy. It was all Barbee could do to keep it upright.

This boat was a failure, but Pop and Barbee thought they knew what corrections were needed. They built another. And another.

Five boats and three years later, they took stock of their experimental racers. Each boat, they agreed, had performed better than the one before it. But they were losing too much time on turns. They had to cut down wind resistance.

Then Pop had the idea that put him in the trophy-winning department. At Dallas' Love Field the Air Force was operating a wind tunnel. Pop and Barbee carted Boat No. 5 to the airfield and talked the officer in charge of the wind tunnel into giving the boat a test. The wind was turned on and the boat went into wild spins. The officer told Pop how to reshape the boat. Take three inches off the prow, taper her more here and there . . .

Flies Boat in Wind Tunnel

Boat No. 6 was built according to the recommendations of the wind-tunnel officer. Then Pop took the boat to the airfield. The craft was suspended, across the transom, on a horizontal steel rod that could ride up and down on ball-bearing tracks on either side of the tunnel. On went the air, and the boat climbed gracefully off the floor and remained suspended in the wind, perfectly balanced in the stream of air.

From the tunnel the boat was taken to White Rock Lake. The boat rode the ripples in a straight, smooth line. Bar-

A SPRAY of Texas lake water and a competitor are left behind as a Comet easily takes the lead in an outboard race. Winning races has become a habit with Willis boats.

bee got set to give the boat its big test. He put it in a turn. The little craft slid smoothly around and quickly was off again on the straightaway.

A few days later, a Texas boat club held a race at Inks Lake, near Austin in Central Texas. In that race, Barbee clocked a new unofficial world's record.

That race put Pop in the speedboat business. He named his boat the Comet, and the name stands today as a shining emblem of speed on water.

First Big Win Was in '47

A Comet won its first official national record in 1947. In fact, Wally Harper of Detroit, Mich., won three trophies in a Comet, and enough points to claim the NOA's title of Mr. Outboard of 1947.

The following year Pop was working in his shop when a telegram came from Lake Alfred, Fla. The message read: "Frank Stanford, Lake Alfred, Fla., won C Racing Runabout in Willis Comet, setting new world record 53.223 miles per hour. Herman second, Henry third."

The other men mentioned were Herman Mayhew of Dallas and Henry Taubert of San Antonio. They also were Pop's customers.

Since then, Pop has sold the garage equipment and turned all the space over to boatmaking. Popularity of his boats was demonstrated at the 1950 championship races at Salina, Tenn. Nineteen boats had lined up for the Class C Runabout finals when a friend asked Pop for whom was he rooting.

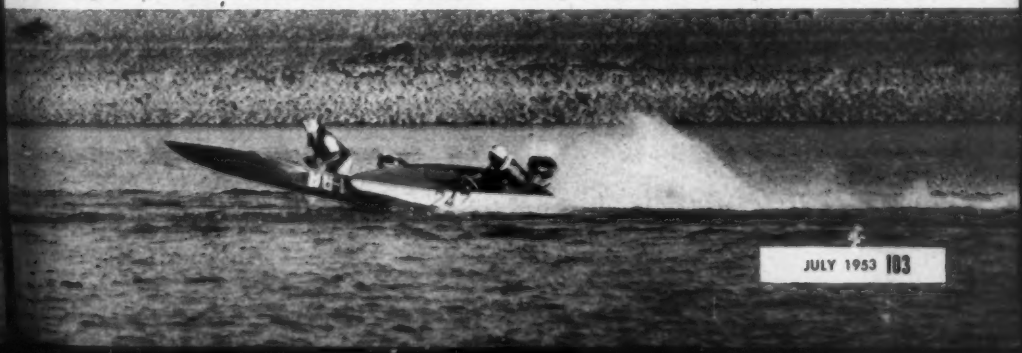
"Well," drawled Pop, "all I can say right now is—'Come on, boats!' "

Because every boat in the race was a Willis Comet. END

"COME ON, BOATS!" yells Pop Willis as he starts a race. Since most of the craft in the race are probably his, he can't play favorites by rooting for any one of the entries.

SMILING WINNER of a National Outboard Association's championship race accepts his trophy from Pop Willis. The winning boat? A Comet, naturally, shown on trailer.

TAKING THE LEAD in a turn, a Comet justifies Pop Willis' unorthodox use of a wind tunnel to iron out kinks that made early models navigate turns with the speed of a barge.



He Packs His Own Power

OTHER gadgeteers have used propellers to power their bikes, but Josef Redenboeck of Munich went them one better—he put the engine and prop on a pack he straps to his back. He dreamed up the rig when he grew tired of pumping over German hills to get to ski runs (note skis hung on bike).

They Got in by the Front Door

THE whole front of this Italian two-seater swings open and the steering column angles forward to let the riders in and out easily. The engine—in the rear, naturally—produces 9½ horsepower and is claimed to deliver 120 miles to a gallon of gasoline. Top speed of the Iso is 55 miles an hour.

Messerschmitt's Back in Business — with Scooters

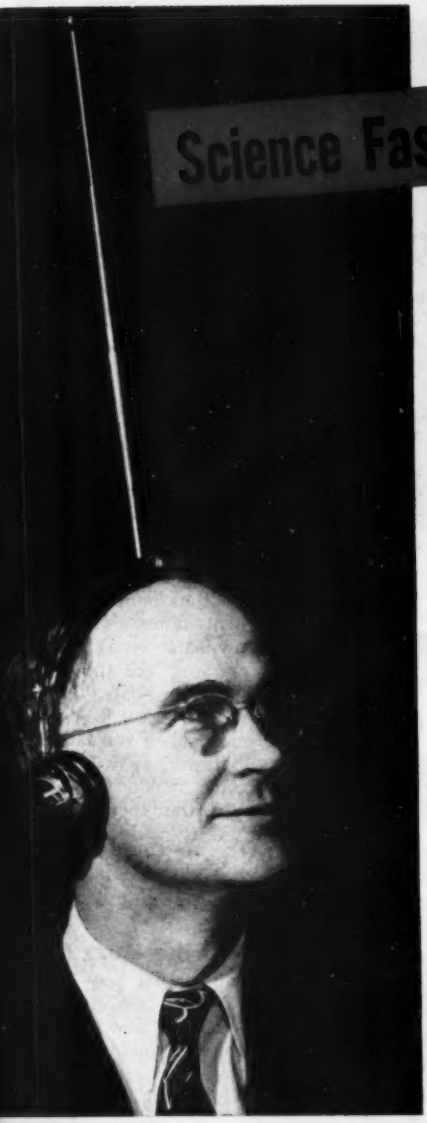
WILLY MESSERSCHMITT made a name for himself during World War II as designer of some of the Luftwaffe's hottest warplanes. His postwar product is about as peaceable as you can get—motor scooters like the two below, displayed at a show in Frankfurt.

The motorized ricksha at left below is powered by a one-cylinder, two-stroke engine. It is said to give 60 miles to a gallon. The cabin scooter (right) has a plastic-bubble top that flops down over the passengers. They sell for about $500 each.

Science Fashion Show

Tank Cleaner Dons Weird Garb

IT MAY not be glamorous, but it's safe. This costume is worn by GIs who climb inside and clean the wing tanks of Air Force Globemaster transports. The suit protects against strong cleaning solvents and a hose supplies oxygen for breathing.



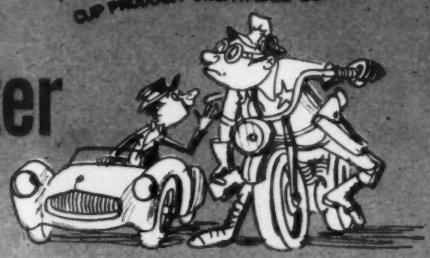
Physicist Dresses for Dinner

DR. WILLIAM SHOCKLEY wore this headset radio at an American Physical Society banquet to amuse fellow scientists with a mind-reading act. Seated on stage, he unerringly identified objects handed to his wife as she moved among the guests. She carried a hidden, pocket-sized radio transmitter that relayed her whispered answers. Tiny Bell Lab transistors made the sets possible.

All Wrapped Up in Their Work

WEARING heat-resistant coats, foundrymen look like actors in a movie fantasy. They are casting a six-ton aluminum-bronze part for a hydroelectric-plant turbine. The inferno-like scene was photographed at Ampco Metal, Inc., Milwaukee.

How a Speedometer Works



Precision-built but rugged, it uses a whirling magnetic field to swing the pointer across the dial.

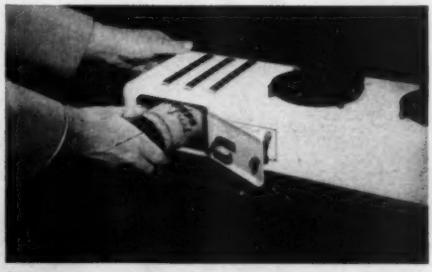
DON'T try to tell a traffic cop that your speedometer is slipping. But it's a fact. The trim case of the most-read gauge on the dashboard houses one of the weakest, and at the same time most useful, "fluid" couplings ever devised.

To get a rough idea of how it works, picture a couple of tiny motorboats whirling in tight circles in a shallow tub. Between these motorboats and the walls of the tub are two lazy little men in rowboats. They have found that they can ship their oars and let the current set up by the motorboats draw them along. Naturally the rowboats won't move at anything like the speed of the motorboats. But their rate of travel will be proportional—if the motorboats go faster, so will the rowboats.

In the speedometer we also have a tub. It is made of iron and called a field cup. At its center is a bearing,

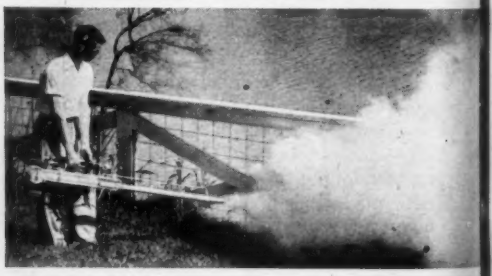
Canned Gas Fuels Stove

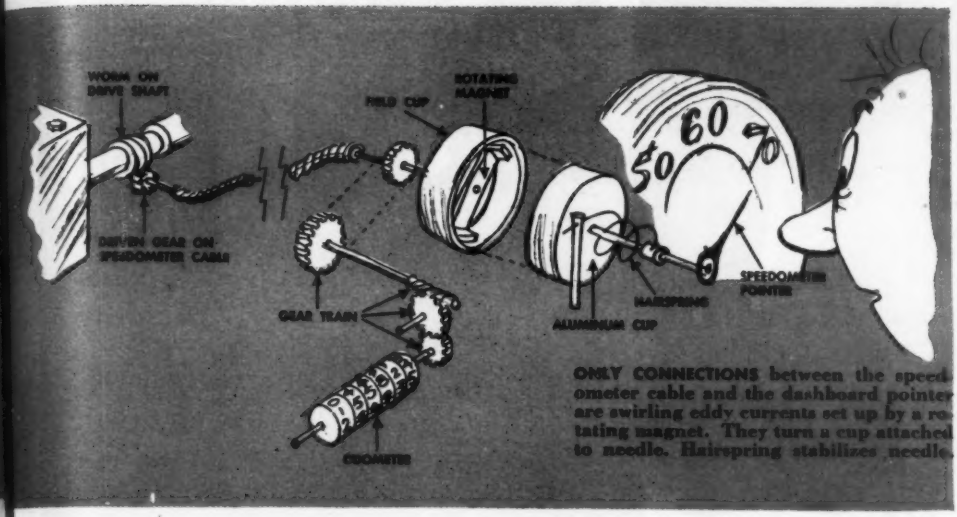
THIS portable two-burner, porcelain-enameled stove will cook outdoors or take over in the kitchen when you're short on burners or suffering a power failure. It burns liquefied-gas fuel from cans that look like bug bombs. Prepo Corp., Skokie, Ill., makes it.



Sprayer Works Like Buzz Bomb

THE pulse-jet engine that flew V-1 buzz bombs in World War II now has a more peaceful use—powering a new spray gun. Its exhaust vaporizes insecticide into a dense bug-killing fog. Made in Germany, Swing-fog is sold here by Devenco, Inc., NYC.





ONLY CONNECTIONS between the speedometer cable and the dashboard pointer are swirling eddy currents set up by a rotating magnet. They turn a cup attached to needle. Hairspring stabilizes needle.

with a short shaft passing through it. Attached to the end of the shaft inside the cup is a permanent bar magnet. The other end of the shaft is coupled to the speedometer cable. When your car gets under way the magnet becomes a whirling paddle. Its ends set up a swirling magnetic field in the cup.

The pointer is mounted on a shaft attached to a second cup, made of aluminum. It fits loosely inside the field cup, within the rotating magnetic field set up by the bar magnet. This moving field generates minute electric currents—called eddy currents—in the aluminum. Each eddy current produces a tiny magnetic field of its own. These temporary local fields interact with the spinning magnet, turning the aluminum cup much as the rowboats are moved by the motorboats.

Unlike the rowboats, however, the driven cup must not be allowed to travel in circles. That's where the slippage comes in. To stabilize the pointer, speedometer manufacturers place a fine hairspring on the shaft behind it. As carefully adjusted as the hairspring in your watch, it holds the needle right on the nose in the lower speed range, but lifts it a couple of miles above true readings when your bus gets up to 50.

Ribbon Chute Cools the Heels of a Hot Fighter Plane

RIBBON chutes, already used for braking the big fellows, are now doing a job for interceptors, too. With a drag chute, the F-94C Starfire below can come in to land rolling faster than 200 miles an hour and coast to a stop in half the usual distance. Lockheed engineers say the chute doubles the life of brakes and tires.

Important for forward-area operations, the 65-pound assembly can be repacked in five minutes and installed in the plane ready for flight in another 90 seconds.

Scooter Unfolds from a Box the Size of a Suitcase

STOWED in the package at left above is a complete motor scooter weighing about 84 pounds. The detachable front wheel and handle bars tuck away underneath the seat to form a box 21 inches long, 10 inches wide and 15 inches high. When set up for the road, as at right, the French Valmobile can make 43 miles an hour.

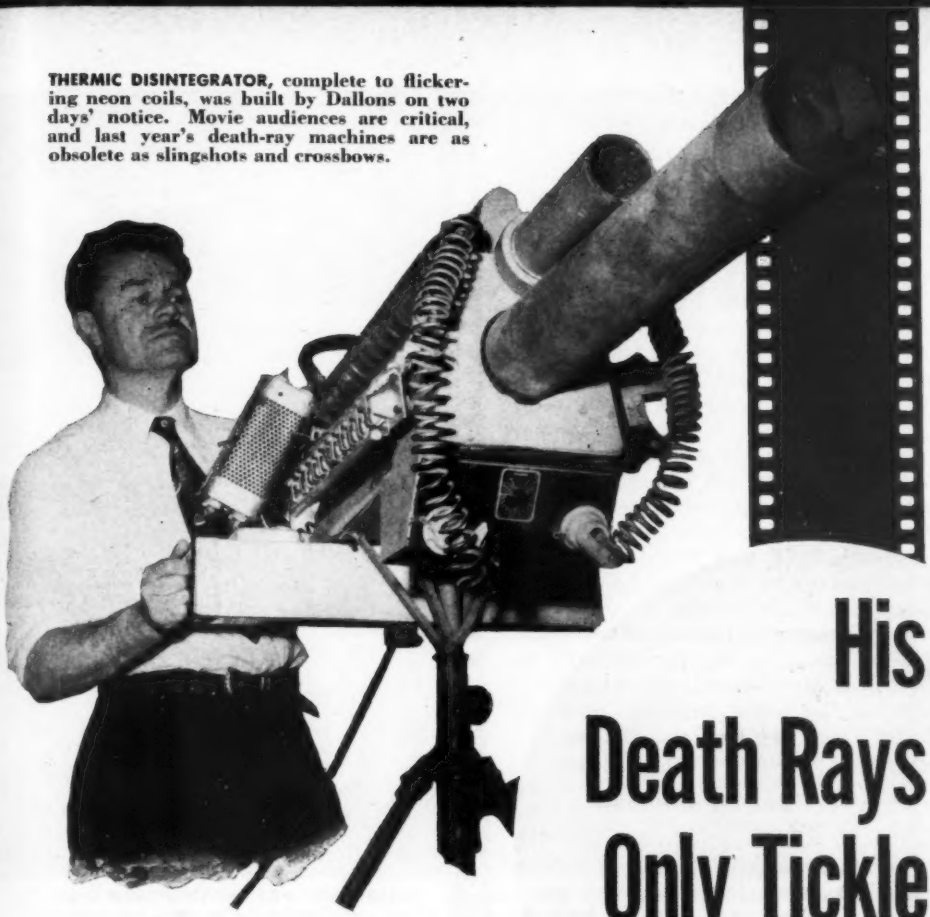
Fabric Dresses Up Refrigerator

EVERY time the kitchen is redecorated, the face of this all-porcelain refrigerator can be changed, too. Molding and trim lift off the door so that it can be covered with fabric to match curtains or walls. It's an International Harvester refrigerator.

Safe Deposit for Hot Isotopes

HERE'S how they store "hot" isotopes at the new Argonne Cancer Research Hospital in Chicago. Sealed in lead containers two feet high, the radioisotopes are dropped into steel tubes embedded in a concrete vault extending eight feet below the basement.

THERMIC DISINTEGRATOR, complete to flickering neon coils, was built by Dallons on two days' notice. Movie audiences are critical, and last year's death-ray machines are as obsolete as slingshots and crossbows.



His Death Rays Only Tickle Your Spine

Oscar Dallons' pseudo-science gizmos make him Hollywood's top inventor of fantastic props.

BY TURNING a scientifically trained imagination, part time, to thinking up startling gadgets for science-fiction movies, Oscar Dallons has become Hollywood's No. 1 designer of "effect machines." It's a dull week when he doesn't turn out at least one thermic disintegrator, quadro-oscillator or degravitizer.

Dallons would like people to think of him as a painstaking scientist who makes medical apparatus for hospitals and doctors' offices—which he also does. But at heart he's a gadgeteer.

The 49-year-old physicist gets a big bang out of his neon-lighted potboilers, and frankly admits that he tosses a good

part of his technical knowledge out of the window whenever a studio asks him to go space-happy.

"Gizmo-minded movie audiences don't care what's back of an instrument panel," he says. "All they want is something that looks convincing, with plenty of action and sound."

Dallons dishes out the special effects at a breath-taking pace. Literally, as well as figuratively, for glass-blowing is a basic part of his art. With brothers Paul and Franz supplying the lung power, coiled tubes, globes, viewing screens and parabolic cones sprout like mushrooms, overnight, in Dallons' laboratory. They are the real eye catchers—gimmicks which produce distorted images, flicker with eerie light, and provide the transparent arteries for vegetable-dyed liquids charged with air bubbles.

Smoke comes next as a pseudo-science thriller-diller. The A-bomb has little to do with it. A well-timed puff of nebulous vapor is the oldest trick in the witch doctor's medicine bag, and Dallons has been using it effectively for 20 years.

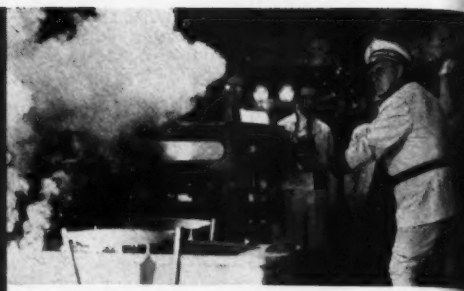
Space Helmets Lose Antennas

"But it's a fact," he admits, "that my super-cosmic machines quickly grow stale. Take as simple a thing as an interplanetary helmet. A few years back it had to be equipped with towering antennas. Today, the youngest space cadet knows that it's no trick to contact Jupiter with a mind monitor no larger than a transistor."

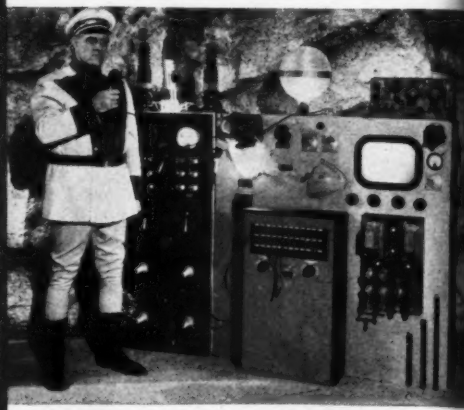
That's why Dallons carts truckloads of obsolete equipment to the dumps each year. About the only permanent props are the generators, transmitters and transformers which furnish basic power for ever more efficient hypnotic-ray cabinets, telopticons, sonic vibrators, prysmic catapults, and you-name-its.

When directors meet Dallons on the street and ask, "What are you building now?" he answers them with a question of his own.

"What do you want? I'll have it for you by tomorrow morning."—*Andrew R. Boone.*

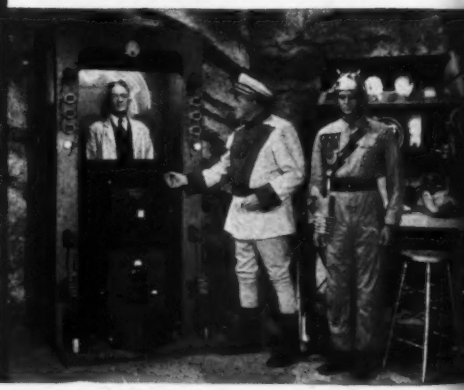


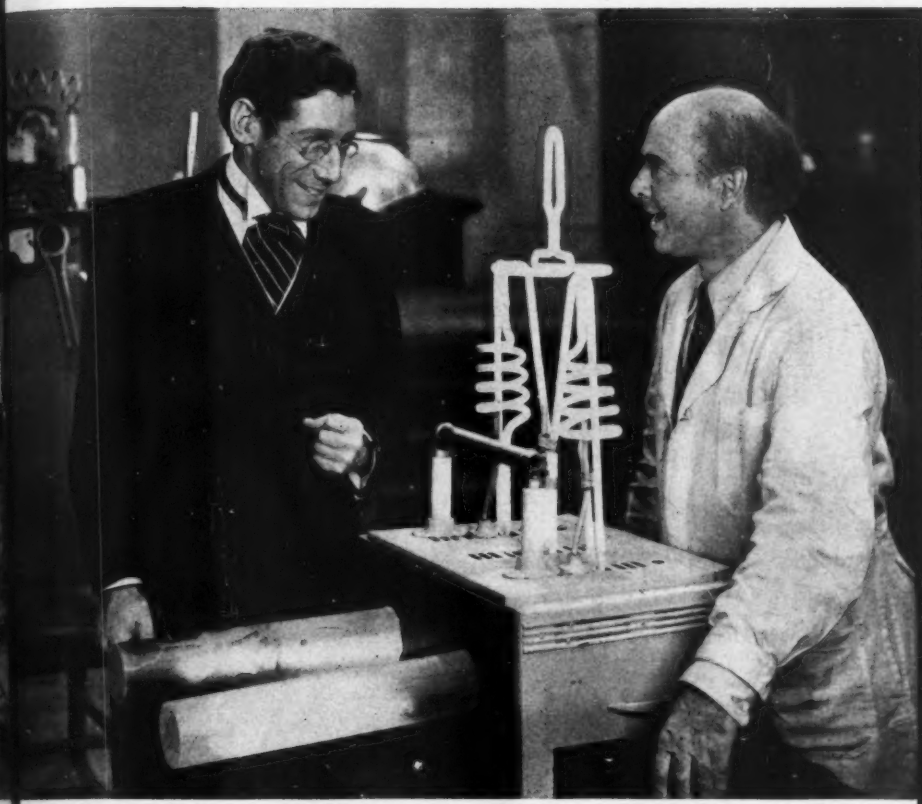
DEATH-RAY MACHINE spumes fire and smoke in a Columbia Pictures thriller. "White-hot" gun barrel is internally lighted cylinder of frosted glass.



INTERPLANETARY SWITCHBOARD combines all the tricks in Dallons' trade. Globes glow and relays chatter as image appears on scanning screen.

ELECTRONIC HYPNOTIZER, which puts subjects in superhuman work-producing trance, makes use of dramatic lighting behind observation window.

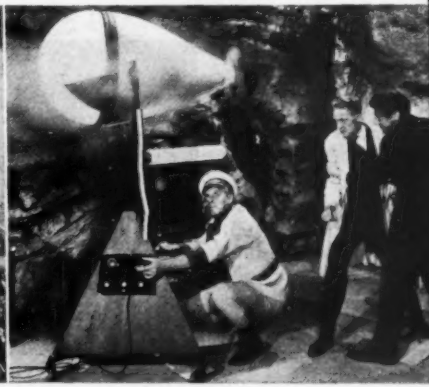


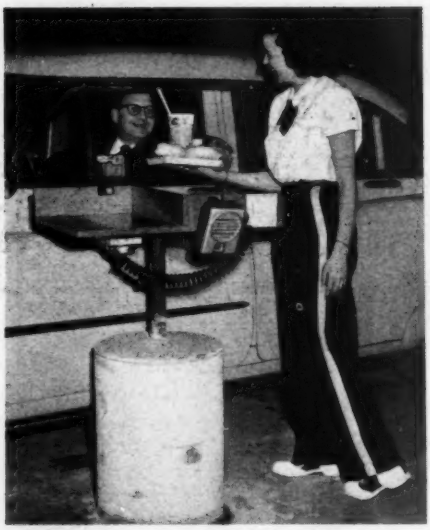


COSMIC VAPORIZER was tube-bending job for Dallons' glass-blowing brothers, Paul and Franz. Apart from its ion circulators, this gadget called for a resistor, transformer case and heavy-duty insulators—all stock items in Dallons' huge war-surplus collection. Snapping switches and power-hum heighten realistic effect.

HIGH-VOLTAGE DECIMATOR throws flash powder—not juice—from horn-shaped firing ports. Pilot light accents buzz of synchronized audio signal.

GYRO DEATH RAY has warhead made of a B-29 landing light. Propeller at rear throws darts of light reflected from cathode tube attached to rotor mast.





Curbside Mike Takes Orders

CAR-HOPS at a drive-in restaurant in Willowick, Ohio, make only one round trip to serve a customer. The motorist calls in his order over an intercom fixed to the curbside standard shown above.

Clock-Radio Made Portable

THIS portable radio has a spring-wound clock to turn it off and on or to chime an alarm. A power-saver switch saves the set's batteries when high volume isn't needed. It's the Skymaster, made by Crosley.

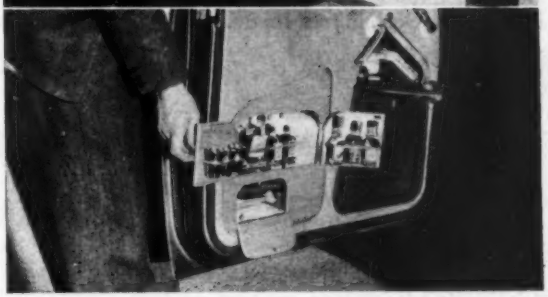
Truck Bumper Shields Shop

TEN feet off the ground may seem like an odd place to find an automobile bumper (above), but it's there to do the same job it does on a car. It protects the shop overhang from damage by high trucks passing down the narrow English village street.

It's Always Raining on This Cadillac

CAR testers don't wait for bad weather to find out how a windshield wiper will act in a downpour or a drizzle. They make it rain. At the GM Proving Ground (right) a trailer hauls drums of water and a pump to supply spray pipes at the front of this Cadillac that keep the car's windshield wet.

Gadget-Hung Car Wins Distance Race



THIS Hillman Minx, five-time winner of the annual Monte Carlo Rally, was lavishly rigged up to give M. B. Anderson solid comfort on the 1,000-mile drive. A washbasin with running water is set in one door, a first-aid kit and a bar in the other (photos at right).

Fresh water, pumped from a tank under the floor, is heated by circulation through a copper coil around the exhaust pipe. A second sink, and an oven heated by the engine's hot-water system, is in front of the co-driver. A tape recording describing the route eliminated the chore of map reading.

They Say Now.....

"As the scientist continues to bring forth new knowledge, the engineer will continue to use it to open new doors."—EVERETT S. LEE, EDITOR, GENERAL ELECTRIC REVIEW.

"Most of the achievements we have were beaten out of stubborn resistance . . . in a deliberate manner toward a deliberate goal."—MAURICE NELLES, RESEARCH DIRECTOR, BORG-WARNER CORP.

"You'll never hear an airline pilot say that he's under the weather. That's where he wants to be. Everyone else wants to get up in the world, but his problem is how to get down." —CAPT. HIRAM W. SHERIDAN, AMERICAN AIRLINES.

Refrigerator Goes Places

THE Wonderbar not only brings refrigeration out of the kitchen, but a new tricycle, tubular-steel cart enables it to be wheeled from room to room and onto a terrace. Main unit is Servel's refrigerette.

Flak Didn't Faze This Prop

HERE is evidence that the propeller is still doing a job in this jet age. Even with an 18-inch bite in it from enemy fire in Korea, the prop brought its Navy AD fighter-bomber back to a repair base.

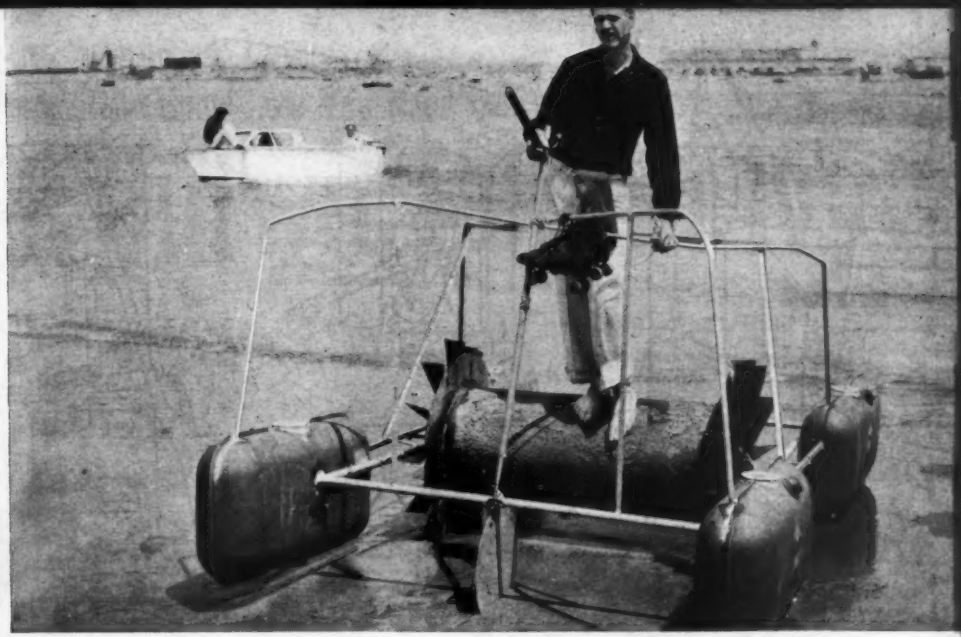
Newest Airplane Engine Weds Turbine and Diesel

HIGH-SPEED jet airliners will no doubt capture the luxury air-travel business of tomorrow, but some British designers believe there will be a place for a slow but really low-fare and cheap-freight transport. Its power plant would be a new combination diesel-turbine engine driving a propeller. By slow, they mean a 350-mile-an-hour cruising speed.

This Nomad power plant (opposite page) is basically a simple diesel engine, with 12 cylinders horizontally opposed. But unlike other diesels, it is two-stroke, without either poppet or sleeve valves. In the past, the two-stroke has not been used for compression ignition because of the difficulty of getting a sufficiently high compression ratio.

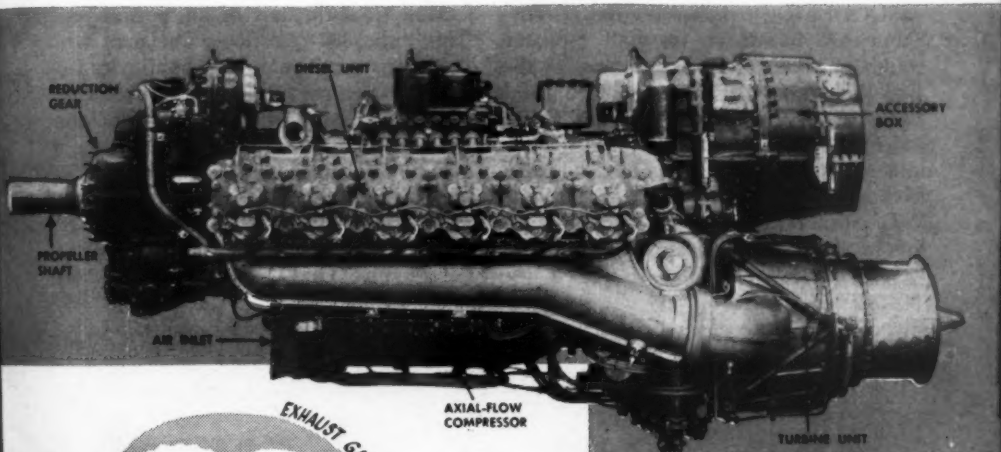
The Nomad meets this difficulty by supercharging, using an axial-flow compressor of the jet-engine type. The compressor is mounted below the diesel unit, and is driven by a gas turbine mounted at the rear. The turbine is fed by exhaust gases from the diesel cylinders. It, in turn, drives the compressor through a straight shaft connection. There is power to spare from the turbine, however, and this is added to the crankshaft by a gear train located at the rear of the diesel unit.

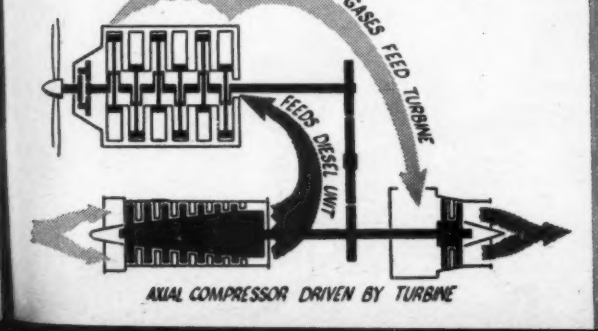
Engineers of the Napier Co., who designed the engine, point out that although the Nomad is heavier than a pure turboprop, this disadvantage is more than counterbalanced by a very low fuel consumption. It can operate on diesel fuel, kerosene or low-quality gasoline.



When Roller Skates Fail, Mr. Smith Walks on Water

THE aqua-skater invented by Charles F. Smith of Los Angeles consists of a revolving barrel in the center of an aluminum-tube framework. It is supported in the water by four surplus airplane gasoline tanks. The idea was to spin the barrel while wearing roller skates. When that didn't work on the rubber-coated cylinder, Smith hung his skates on a crossbar and did the barrel-spinning with his bare feet.





DIESEL-PLUS-TURBINE engine is shown in photo above. Drawing at left illustrates how this new British Napier Nomad airplane power plant operates to give maximum fuel economy.

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"Watch out, Fred! Here it comes again!"

A GOLFER got poison ivy recently because he drove his ball into the rough. The ball crushed leaves of the ivy, picked up the sap, then bounced back onto the fairway. The golfer touched the sap on the ball and it gave him the rash. He never saw the plant that poisoned him.

To catch poison ivy, you don't have to touch, or even see, the plant itself. You have to contact the sap.

Why does the sap, or oil, poison you? That's the $64 question. The man who could answer it in July, when ivy is full of early-summer oil, could make a lot more than $64, particularly if his answer resulted in an immunizer.

No man can—yet. But at Columbia University, in New York City, Professor of Chemistry Charles R. Dawson has gotten closer to the answer than anyone before him. One of these Julys he may

Poison ivy has many forms, from berries to a variety

Here's the Know-How You Need to

Outwit Poison Ivy

... And now's a good time to root out this unwelcome visitor before it settles down in your yard as a year-round resident.

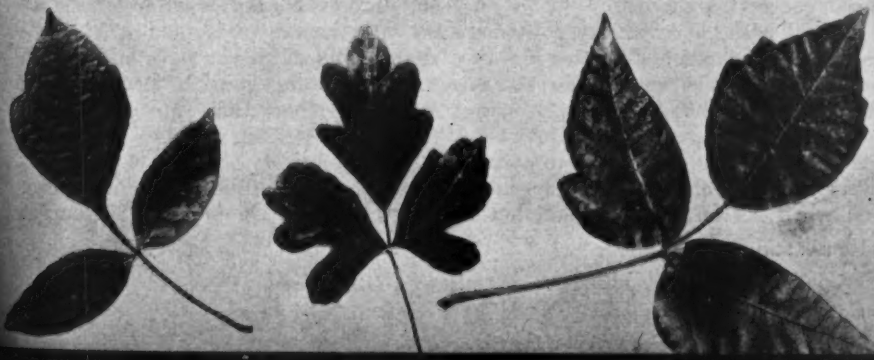
have it. If so, there may be a pill that will prevent your catching poison ivy.

Professor Dawson has become the first scientist to break down the poison-ivy oil so that he knows its four distinct parts: one solid, three liquids. Now he's trying to find out exactly what each of the four parts does, that is, which poisons you.

For 50 years scientists have argued over what it is in the sap that poisons people. Professor Dawson, like some other leading chemists today and like many modern skin specialists, thinks that perhaps this confusion has come about because poison ivy works on you with more than one part of the sap, and that you need two exposures to break out with the rash.

His assertion is that one, or more, of the four parts of the oil acts on you as a sensitizer. At your first contact, this pre-

of three-leaved plants, but none is friendly to humans.



Do This

10 Ways You Can Fight Poison Ivy

Don't Do This

WEAR OLD CLOTHES and leather gloves when you start out to fight ivy. And, to be on the safe side, burn clothing later.

SPRAY IVY with any one of 15 killing sprays recommended by the U. S. Dept. of Agriculture. Respray plants also.

DON'T TOUCH ivy with bare hands. If you touch it accidentally, scrub immediately with strong laundry soap.

DON'T BURN uprooted plants. Poisonous sap is carried on smoke particles and can be as dangerous as live plants.

pares you to be poisoned later. Then, at a later exposure, one or more of the parts gives you the rash. The exposures can be 96 hours to one year apart.

This idea of two exposures shows, for example, why a person can think he is immune while he actually is not. He may have had one exposure and need only another one to break out.

Here are some reported cases of ivy poisoning. The two-exposure theory means that all these people had been exposed to the sap somewhere before a second contact caught them:

- A child broke out with ivy poisoning from hand-me-down clothes sent him by a cousin 500 miles away. The cousin had worn the clothes as he romped in an ivy patch. The sap, a thick, brownish-yellow liquid, retains its power to poison a year or longer after leaving the plant, even when it's turned black and hard.
- Families have caught ivy poisoning simply by petting their dogs. The pets had rambled through the ivy, and carried the oil on their hair. Most animals do not break out with the rash.
- Persons have got ivy poisoning by driving in their cars into the country, brushing ivy with a door handle, and touching oil on the handle when opening or closing the door later.

Sap on Wheel Stays Poisonous

This car-door business can cause you the dickens of a time if, after getting sap on your hand, you spread it over the steering wheel. If you have had a sensitizing exposure, you can break out all over again every time you pick up new oil from the steering wheel.

With poison ivy so pesky, a pill to immunize you would be a blessing indeed. That's why Dr. Dawson and a group of

CUT SHOOTS with sickle if roots are intertwined with harmless, ornamental plants. Don't touch blade until it's cleaned.

PULL UP IVY when ground is soft and destroy it with a chemical spray. When ground is hard, break off shoots.

SEAR PLANTS with blowtorch, passing flame over until leaves blacken, wilt. Several searings are needed to kill roots.

DON'T RE-USE tools before cleaning them with gasoline. Scour sickle blade and sprayer parts that touched ivy.

DON'T TAKE chances with unknown three-leaved plants resembling poison ivy. "Leaves three, let it be," is good rule.

DON'T EAT ivy to get immunity. It won't work, despite old wives' tales. And ivy can be irritating internally.

graduate chemistry students at Columbia are working furiously.

That—and the fact that poison ivy is spreading. Already it exists in every state, Canada and Mexico. But, unlike most wild plants, poison ivy does not die or do poorly when human beings move into its area. In fact, it does better than ever around people—in towns, camps, new home developments.

It is found along paths or roads. It runs across your lawn, hiding in the grass, or along your hedge. It can mingle with ornamental shrubbery. It can climb your lamppost, rock wall, tree, or even the outside wall of your home. Many a homeowner has prized his new ivy—till unfortunate results (redness, blisters, itching, burning) showed up on hands, face, or other skin areas. Yet, if the homeowner discovers the vine and cuts it back, it can change itself into a shrub up to 30 inches high and live without vining at all.

It lives many years, yet it takes only two months for a seedling to get so well dug in that one mowing won't kill it. It can even play possum. A plant can appear lifeless for months, then revive.

If there is no pill, you ask, what to do about it? The answer is to eradicate it where you can, to recognize it always, and to keep away from it.

At the University of California College of Agriculture, Researchers Oliver A. Leonard and Lem Osborn have just announced a new eradicator. They report that a mixture of 2, 4-D and 2, 4, 5-T will control poison oak, and will kill it permanently if treatments are continued over two years.

Poison oak is either the same thing as, or the first cousin of, poison ivy. Botanists have not classified the plants defi-

nitely. Poison ivy and oak operate on you exactly the same way—by their sap—and the results are the same to you. In this case, if you don't know what hit you, it doesn't matter. The rash and other symptoms are the same.

Spring and early summer are the best times to apply 2, 4-D and 2, 4, 5-T, Leonard and Osborn reported, with retreatment later in the season necessary—and a new treatment about June 1 the following year for permanent killing.

The Department of Agriculture Farmers' Bulletin 1972 lists earlier eradicators. You can get the Bulletin from the Superintendent of Documents, Washington 25, D.C. (10 cents, no stamps.)

Chemicals are the best eradicators. The most successful ones kill all leaves and 90 percent of roots in one treatment, they are easy to use, and with a long nozzle on a sprayer you need not get close to the ivy.

Ammonium sulfamate is best of all, says Bulletin 1972. This is not harmful to soil, not dangerous under ordinary conditions, will not burn, but will corrode spray equipment. It should be dissolved in water 12 ounces to one gallon for enough solution to kill 98 percent of ivy growing fairly densely in one square rod—272 square feet. To get all the ivy, use this chemical first about June 1; repeat August 1; repeat June 1 next year. Wash sprayer with a solution of lime or soda immediately after use. A week or so will elapse before leaves die.

IVY ON TREES is decorative, but it's same old poison.

Spray Is Good for Weed Crop

The second most effective chemical is 2, 4-D. Follow directions on can; one gallon is enough for one square rod of dense ivy, or two to four square rods of scattered ivy. The third is ammonium thiocyanate, preferably as white crystals: one to one-and-one-half pounds in a gallon of water for one square rod. This harms skin and leather, says the Bulletin, and in time corrodes metal. What's more, because it is rich in nitrogen it causes a crop of weeds a month or two after treatment.

Borax—the only chemical not used as a spray—is listed as fourth best. You scatter borax on the soil 10 to 15 pounds per square rod, and it kills poison ivy over a period of eight weeks. It's easy to handle, nonpoisonous, won't burn, is easy to obtain and not expensive.

Whether you use one of these or any of 11 other chemicals on Bulletin 1972's list, you will probably need several treatments to get rid of all your poison ivy.

Sprays kill many plants besides ivy. Therefore, they can't be used where the ivy appears among valuable plants.

Cut ivy shoots, says Bulletin 1972, only when the first leaf on each stem is full-size. It will take four or more mowings to effect a kill.

Another way to eradicate is to sear the ivy with a hand blowtorch. This means to pass the flame over the plants long enough to wilt the leaves. Three or four searings usually kill roots. Another way still is to spray with fuel oil or crankcase drainings. Like other sprays, oil kills or harms valuable plants as well as poison ivy. Unlike other sprays, oil can harm the thick bark of a tree.

If you think you have been exposed (as when pulling up ivy), run—do not walk—to a shower, wash twice with copious suds from a strong alkaline laundry soap, and rinse, rinse, rinse to try to get the sap off. If you do get rid of it, you'll not break out.

If, despite everything, someone in

[*Continued on page 214*]

Golf Gadgets

Puts Swing in the Groove

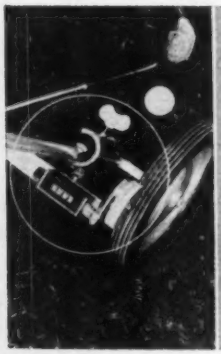
THE lightweight training aid at left will teach a duffer to drive as clean and straight as experts do, the maker says. Linked by a chain to a loop on a curved guide, an arm band reminds him by gentle pressure whenever he deviates from approved form. He's ready to graduate from using the device, called the Swingroov, when his "muscle memory" has made a good swing instinctive.

Tee Stands on Three Legs

TRIPOD-SHAPED, the tee at right holds a ball steady, and needn't be pushed into sunbaked, frozen or muddy ground. The ball rests in a hollow at its top; height is adjustable by bending the legs. Bright colors make the plastic Pee Gee Tees hard to lose.

New Devices Measure Yardage

How long was my drive? How far to the green? Two new aids answer questions like these. Attached to a caddy cart, the Yard-o-Meter (left below) registers yardage as a wheel rolls over the ground. The Golfometer (right below) clips on your belt and works like a pedometer, telling on a dial how many yards you have walked.



Clubs Carried Without Bag

NO NEED for a caddy or golf bag either, if up to eight clubs are enough, and you use this four-ounce Go-Lite carrier to tote them. Raising a bar frees them instantly for use. A pouch holds balls and tees.

I Ain't

Got No Body

By Andrew R. Boone

Meet the railster: a screaming, nitro-burning skeleton on wheels that can leap from zero to 128 m.p.h. in a quarter of a mile.

JAKE SMITH jams his right foot all the way in it. The wide rear tires take a quick bite and his mount leaps from the chute. He watches his tach closely. At 5,600 the singing Merc engine sounds all undone. Jake hits the clutch and shift lever, jamming into high. Thirteen seconds and a quarter of a mile later, he is hitting 128 miles an hour.

That's the railster, the newest darling of the super hot-rodders. A railster is a screaming skeleton on wheels, a hot rod that has been starved to less than half its weight. Essentially, it's an engine mounted on rails cut down from an old car or especially built up from tough chrome moly.

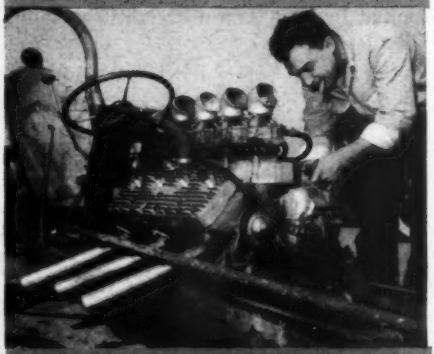
Jake and his fellow rail jockeys are out for one thing—maximum pickup. Take a look at Joaquin Arnett's record-smashing "Bean Bandit."

The Bandit's 1,325 pounds pack a 275-cubic-inch Merc with 3 5/16-inch bore and four-inch stroke. The ported and relieved block uses 1⅝-inch intake and stock exhaust valves. The front-end assembly came from a '37 Ford, while a

MODIFIED RAILSTER run by Bob Gorman has Austin body and G-string hood for safety if 1,565-lb. car capsizes or engine blows up. Car has hit 12[illegible] m.p.h.

HOOD on this railster aids streamlining, cuts cooling. Car has '29 Chevvy rails, narrowed four inches in the front and 12 in the rear.

GEARS are swapped into quick-change rear end by driver Art Chrisman. Five sets of gears give him plenty of combinations. Car has made 138 m.p.h.



MECHANICS work feverishly between dashes. Carburetor jets, spark plugs, fuel mix are changed often. Plugs may burn in single run.

FOUR GALLONS of water are poured into tubes connecting two sides of engine block. Radiators are not used. Some engines shunt toward rear for traction.

Ford rear end encloses a locked differential and 3.78 gears. A '41 Ford front-stabilizer bar replaces the rear cross spring, giving torsion-bar suspension. Speed to date: 135 miles per hour.

The railster's fuel is nitromethane and alky. Standard mixture: nitro and alky 50-50. A 10-minute warm-up, quarter-mile dash, and return to the pits takes nearly a gallon. Cost: $2.00.

Pounding one of these babies down the straightaway is both an art and a science.

"From the time the flag drops," explains Art Chrisman, whose slick red beauty has been winning drags regularly, "you're on the verge of no traction. I've seen rear ends leap six inches at the take-off. That's why we move the engine back to get at least half the weight on the rear. You install wide asphalt slicks in the rear for maximum traction—standard tires capped with a flat strip.

"The flag drops. You hit the throttle and drop the clutch off to get going fast. We use only two gears—second and high. An event can be won or lost in the split second of shifting. I ease off on the throttle only briefly, because I've got to keep the r.p.m. high. Unless traction breaks we go all the way at full throttle."

A Handful of Fans Start Fad

The rail craze started with a handful of riders trying for more speed by eliminating bodies, including hoods. As weight went down, pickup and speed went up. But one boy lost his life when his car sideswiped another, and the drag operators, such as the Pomona Choppers (PSM, Sept. '52, p. 142), took a closer look. Drivers, they knew, must be protected in case a hose blows off or an engine fire starts. Now Pomona has ruled that each dragster must have some type of body, fire wall, hood, floor boards or belly pan, safety belt and crash helmet.

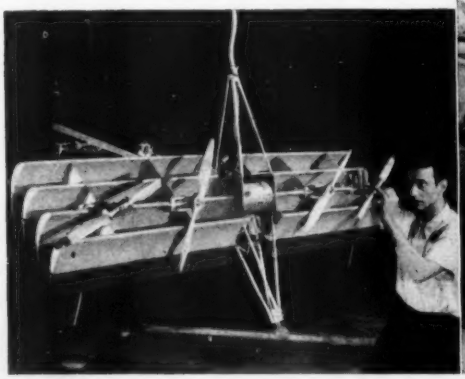
A fellow may lay out $1,000 and put in 1,000 hours reworking a junker into a railster. If he's good, he may be tops now and then. What is his reward? Perhaps a $50 bond, more likely an engraved cup. Nothing more except personal satisfaction—and the hope of hitting 150. END

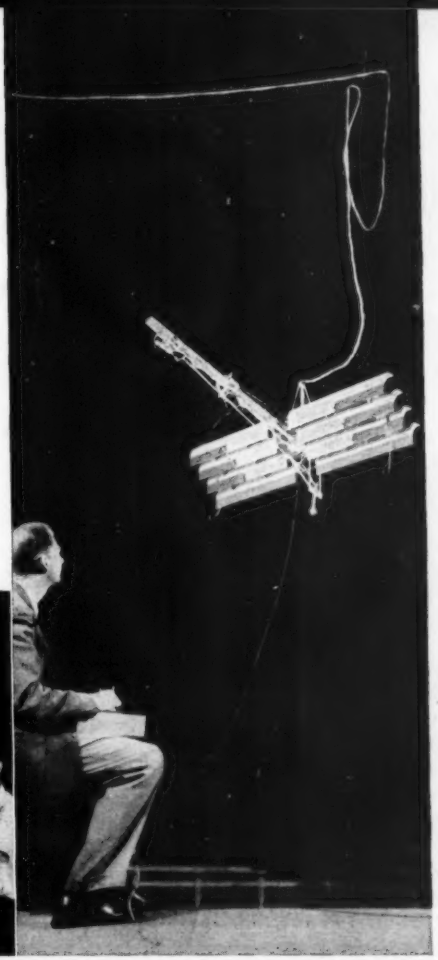
Slat Plane Goes Straight Up

HIGH-SPEED airliners of the future may have "Venetian-blind" wings that will enable them to take off straight up and to hover in flight like this model being "flown" in a National Advisory Committee for Aeronautics laboratory at Langley, Va.

How it works is shown in photo below. The propellers remain in fixed position at all times. For vertical take-off and for hovering in mid-air, the variable slats are curved downward, thus forcing the powerful slipstream downward instead of rearward.

For forward flight in an actual plane of this type, the pilot would slowly close the slats to form a solid wing, directing the slipstream rearward. Jet or turboprop engines with very high power for their weight would be needed, says NACA.





This Hardtop Convertible Really Converts

ADD dream cars: Ford's new Syrtis, shown in a model below. The Roof-O-Matic top is its main innovation. Press a button and the top lowers into a level position beneath the rear-deck lid. The rear window can be swung overhead and against the back of the front seat as a windshield. It is still in the development stage.

What's Your Funniest

Maybe it's funny enough to win you this Model T:

WHEN talk turns to Model Ts, everyone who ever owned or drove one tries to get in the act. They all want to tell a story.

Now you can make your Model T story pay off. We will give the Model T you see on these pages to the person who sends in the best story about:

"My funniest experience with a Model T."

The Model T we're giving away is the 1925 runabout we restored and told about in a series of articles in February, March and April. The car is now in top condition. Nothing extra to buy or do. Just hop in and drive it—if you still remember how.

The Ford Motor Company, which is celebrating its 50th anniversary this year, will deliver the runabout anywhere in the United States. The Ford dealer in the winner's home town will present the car.

Besides giving away our Model T, we will pay 10 bucks for every anecdote published in POPULAR SCIENCE MONTHLY. The person who sends the best story will receive the runabout *and* 10 bucks.

These men will decide whose story is best:

Bennett Cerf is known for his best-selling collections of humorous stories, among them *Try and Stop Me*, *Anything for a Laugh* and *Shake Well Before Using*. He is president of two publishing firms, Modern Library, Inc., and Random House, both of which he founded.

Wilbur Shaw knows a good car when he sees one, a good story when he hears one. Now president of the Indianapolis Motor Speedway Corp., he won the big Memorial Day race there in 1937, 1939 and 1940. For the past three years, his Reports from the Driver's Seat have helped keep POPULAR SCIENCE popular.

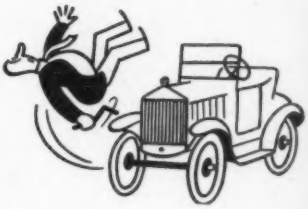
A. K. Mills, director of the Ford Museum and Greenfield Village, was once a newspaper reporter. He went to Europe in 1928 to make preparations for Amelia Earhart's Atlantic flight. In 1949 he joined the Ford Motor Co., after stints with *Time*, *Life*, and service in the Air Force.

Frederick Lewis Allen is editor of *Harper's Magazine* and author of a series of books. In *Only Yesterday*, an informal history of the 1920s, he observed that the "high, hideous, but efficient Model T" was the most common car of that period. Other books include *The Big Change*, and *Since Yesterday*.

Henry E. Edmunds heads the Ford Motor Co. Archives. He has the job of collecting and indexing the records and papers of Henry Ford and the Ford Motor Co., as well as outside material relating to both. He previously served as archivist of the War Production Board and the International Monetary Fund.

Model T Story?

All You Need to Do:



Write your story—preferably on a typewriter—on one side of a single sheet of paper. Write your name and complete address on the same sheet.

Better keep a copy of your story; we expect to receive too many to acknowledge or return the ones we do not pick for publication. Send your story—by August 1—to

Model T Editor, POPULAR SCIENCE MONTHLY,
353 Fourth Avenue, New York 10, N.Y.

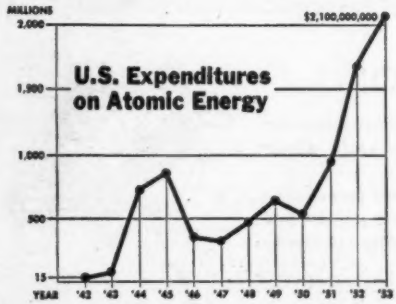
P.S.

Last minute news & notes...

SAFER SWIMMING POOLS are promised by a new method of chlorination that uses 10 to 20 times the normal amount of chlorine. This does not cause eye irritation if the water is made alkaline, reports Eric W. Mood, Yale public-health expert.

A NEW GASOLINE ADDITIVE is reported to give 15 percent more power, extra mileage and increased spark-plug life. Called TCP (for tricresyl phosphate), it's said to keep plugs free of metallic deposits that upset engine performance. Gasoline containing it will be sold by Shell stations for half a cent a gallon over the present price of premium fuel . . . Heat pumps to cool cars in summer, warm them in winter are predicted by Auto-Lite's engineering chief . . . It's the de luxe model that American motorists want, conclude Pontiac executives--customers order 15 expensive cars for every "standard" one.

THE LEANING TOWER OF PISA, now 14 feet out of plumb, can be straightened, suggests Charles B. Spencer, foundation engineer who worked on the White House rebuilding job. Just drill holes to loosen the soil on the high side and let the tower settle back. Otherwise, he warns, it won't last another century.



A MACHINE THAT HAS BABIES has been developed--in mathematics only, not in reality--by Dr. Claude E. Shannon, the Bell Labs' mechanical-brain expert who built the electronic mouse (PSM, Mar. '52, p. 99). He describes it as a "somewhat sinister" computer that would collect parts like its own, then assemble the parts into a duplicate of itself . . . 3-D movies may help some people see better, reports R. A. Sherman of the Bausch & Lomb Optical Co. He says that watching stereo films can help the eyes overcome some coordination defects.

A MAJOR VICTORY OVER TUBERCULOSIS--deaths were halved in the past 12 years--has been reported by the United Nations World Health Organization. Principal cause, says WHO, was not wonder drugs but better public-health measures and improved living conditions . . . If a surgeon forgets a sponge inside his patient, he can find out easily now--a new surgical sponge made by Parke, Davis contains barium sulfate so that it will show up in X rays.

AN ANTI-A-BOMB PILL may come from experiments on mice at Argonne National Laboratory. The animals were protected against killing doses of X rays by cysteine. There's a catch--the cysteine would have to be taken shortly before exposure to the deadly rays.

THE CONQUEST of Mount Everest by a New Zealand beekeeper, Edmond Hillary, and the famous Sherpa guide, Tensing Norkay, on May 29, has shifted the spotlight to K-2, monarch of the Karakorams, as the world's highest unclimbed mountain (p. 70). It took 30 years of trying and 11 expeditions to scale Everest. K-2 has turned back three.

CANNED SODA POP is being introduced in New York this summer . . . A pen that "burps" is said to hold 40 percent more ink. The Eversharp Ventura is designed to force out air that ordinarily prevents complete filling . . . Frozen bread, recently introduced, will taste better, stay fresh for months according to Arnold Bakers.

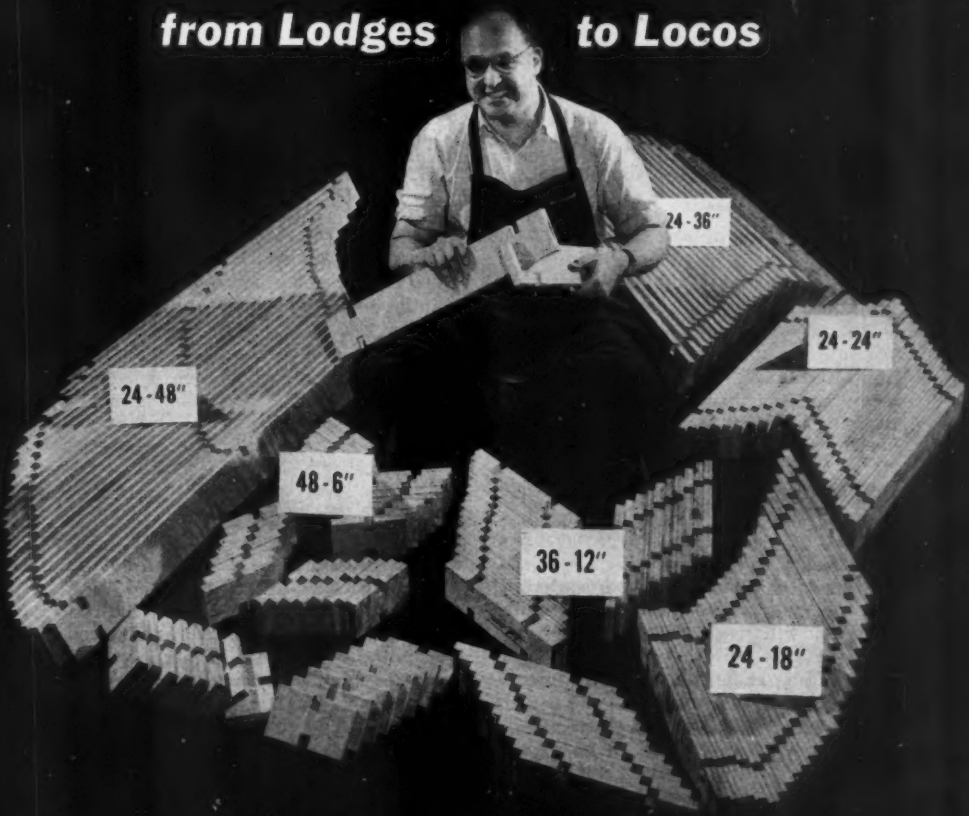
The Editors

MECHANICS
and
HOMEBUILDING

Easy to Make

Play Planks Build Everything

from Lodges to Locos

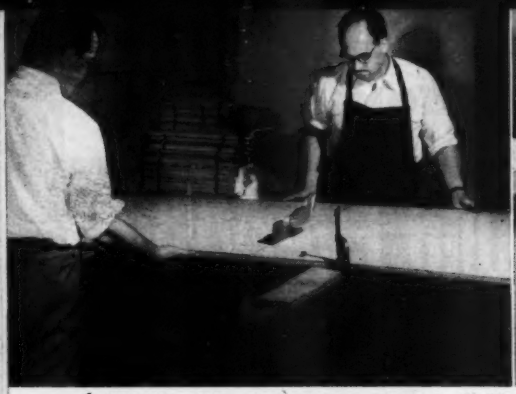


You cut up the plywood. The kids put it back together—into sturdy playhouses.

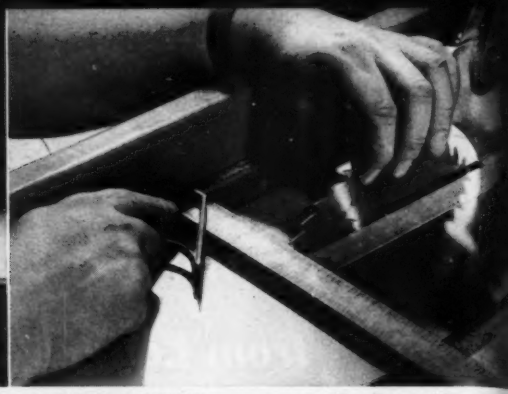
By Hartley E. Howe

STACKED around the cheerful gent in the picture above, are a bandit shack, a doghouse, a pioneer fort, Blackbeard's brig and a spaceship. Also a medieval castle, Gus Wilson's Model Garage, a schoolhouse, a general store, and Casey Jones' locomotive.

Not all at the same time, to be sure. But in rapid succession, as any small boy can quickly show you. For those neat piles of lumber are a construction set—Play Planks—but a set that is as different from the ordinary building toy as an MG is from a pedal car. And you make



1 CUTTING 4′-by-8′ PLYWOOD SHEET in half for easier handling is first step. Board clamped under sheet rides along edge of saw table, helps hold sheet in line. Friend to pull it through is handy. Keep splitter lined up with blade or it will push you off line.



2 RIPPING PLANKS comes next. Set fence 4″ from center of saw-blade edge so kerf is divided equally between each two pieces as they are cut. Measure from both ends of saw slot to make sure fence and blade are parallel. Beware fence slip as you tighten clamp.

it yourself with a table saw and a little sweat.

- It makes things big enough for kids to get into and climb on and squirm through.
- It goes together easily for little kids.
- While it isn't cheap—even when you build it yourself—any father will appreciate a toy that isn't going to be discarded when the gang decides to stop being cowboys and become space cadets or grease monkeys.
- For the beginner with power tools it's an ideal starting project. You'll learn three basic ways of using a table saw—ripping, crosscutting and dado work. And despite the mistakes and clumsy workmanship that go with a first project, the set is so designed that you're almost certain to turn out a plaything that will give the kids a lot of fun.

Play Planks are the brainchild of a Tacoma, Wash., kindergarten teacher, who designed them so that the notches fit together like a log cabin. You can buy a readymade set from a West Coast firm for about $100. But thanks to the Douglas Fir Plywood Association, which has made the plans available, and Monsanto Chemical Corp., which is helping to distribute them, you can build it yourself for about half that amount.

Materials. The basic set shown in picture can be made from three and a half 4′-by-8′ sheets of plywood. This cuts into:

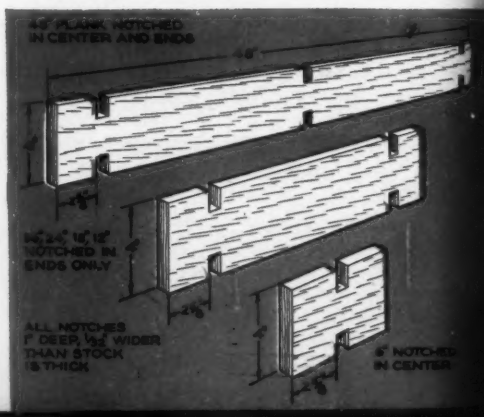
Four dozen planks 6″ long,
Three dozen planks 12″ long,
Two dozen planks 18″ long,
Two dozen planks 24″ long,
Two dozen planks 36″ long,
Two dozen planks 48″ long.

Don't worry if your lumberyard will sell you only full sheets. Your kids can always use extra planks. But don't make them up until you see what sizes are needed.

For sets that are to receive heavy use by fairly large kids, ¾″ sheets are recommended. For smaller kids, or light use, ⅝″ or even ½″ sheets will do. Each time you go down a size you save about three cents a square foot. In any case, good-on-one-side stock works fine. And if the set is to be used outdoors, you want to get exterior-grade plywood. The wood for the planks shown in the pictures—¾″, good-on-one-side, exterior-grade fir plywood—cost about $50 in the vicinity of New York City.

The planks can be used for the roofs as well as the walls of structures. But you can make the set go a lot further if you cut up some roof panels. These can be softboard for indoor use; tempered hardboard for outdoors. Two 4′-long panels about 17″ wide, and two about 29″ wide are all you need. These will fit respectively on roof supports made of 2′ and 3′ planks.

Ripping the planks. If possible, get



3 PUSHING THE SHEET through to rip the planks requires extra care, especially for first few cuts while sheet is still awkward size. Push it against the fence. Watch where sheet meets the fence, not the blade. The sheet may pull away from the fence.

4 CUTTING PLANKS TO LENGTH comes next. Note block clamped to fence so plank end slides along it until just before reaching saw. This leaves space between blade and fence so cutoff piece doesn't jam. Push through with plank held against miter gauge.

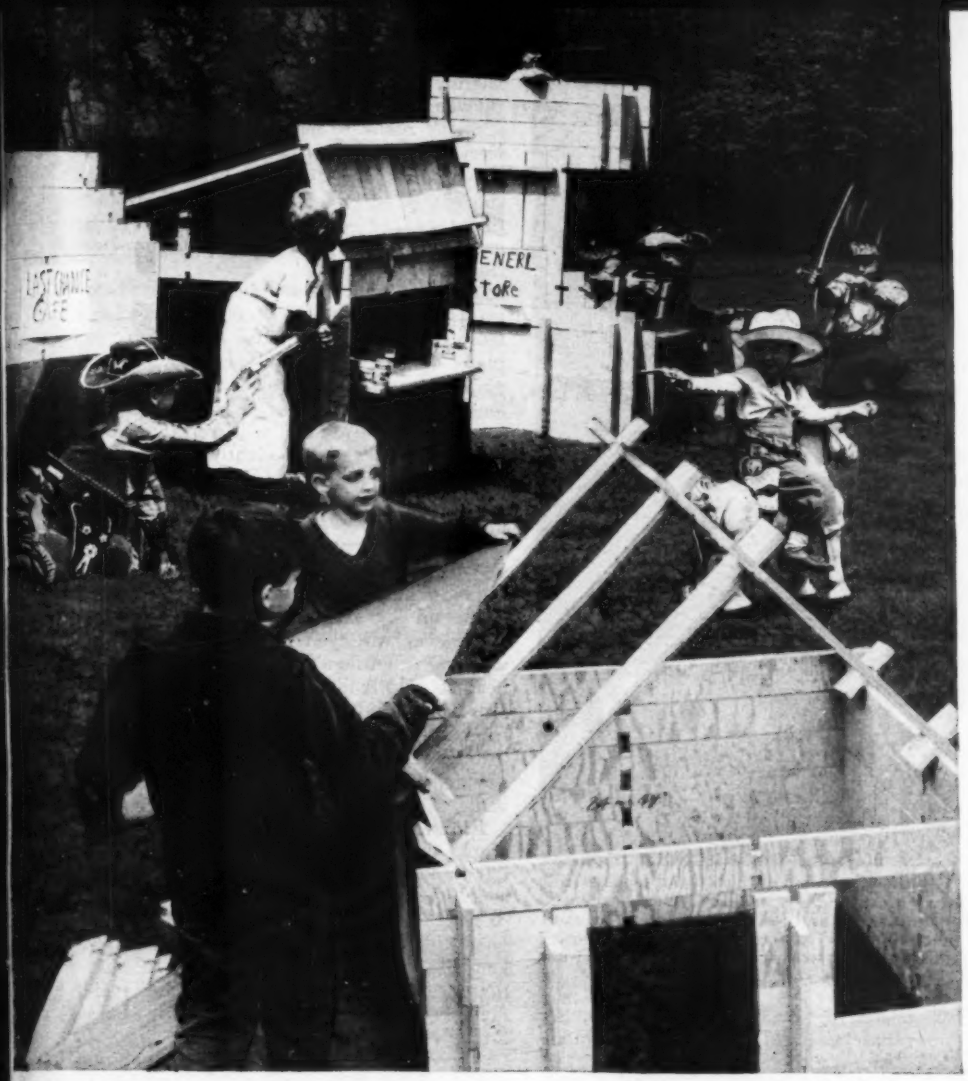
5 DADO HEAD FOR CUTTING NOTCHES must be slightly wider than planks are thick. Pieces of paper between the cutters will permit you to make fine adjustments of width. No matter how accurately you think you measure, make a trial notch on scrap before starting.

6 HEIGHT OF DADO HEAD above table should be exactly the depth of the desired notch —1". Make sure you measure directly above the saw spindle, where the blade tips are highest. And remember to lock the height adjustment in place so it doesn't shift.

7 IN CUTTING NOTCHES, clamp a block against wood extension of miter gauge at the exact distance from cut that you want the notch to be from plank end. Then hold planks snug against block and you can be sure that distances from notch to end will be uniform.

8 IF PLANKS VARY IN LENGTH, jig must be used to keep distance between notches uniform in each set. Cut notches in one end of all pieces. Then when you notch other ends, line up each plank with master plank by piece of scrap through first notches.

ROOMS For
RENT



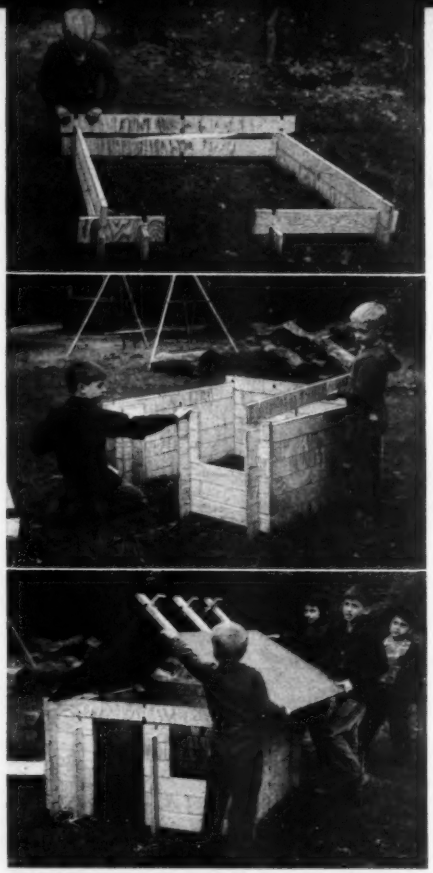
the lumberyard to cut each 4′-by-8′ sheet in half for you. If they don't provide this service, you'll have to do it yourself—and a ¾″ sheet this size is heavy enough so you'll be glad to have help.

An alternate method is to rip the planks out of the full 8′ length of the sheets. This requires only half as many rips, but makes you handle the awkward full-length sheets repeatedly.

With the sheets halved to 4′ by 4′ you can probably rip the planks by yourself. Make the cuts across the original 4′ width of the sheet. Then if you wavered a little in cutting the sheet in half it won't result in planks of varying lengths.

If you're a beginner, you'll find it harder than it looks to turn out an even plank. If the irregularity is too great, you can set the saw fence for the width of the narrowest plank and push the others through again to make them match. But don't worry too much if your planks vary slightly in width. It won't affect their fitting together.

Cutting the lengths. You'll find it easier to end up with the right number of planks if you go about it methodically. You start with 84 planks 4′ long. Put aside



PLAYHOUSE goes up quickly—and teaches kids to cooperate. Note how 6″ pieces are used around doors and windows. Rafters for roof pieces have 6″ pieces notched across lower ends so they can rest on upper edge of wall.

two dozen that will stay that length. Set your saw fence at 2′ and cut 54 two-footers. Put aside 24 of these. Set your fence at 12″ and cut a foot off two dozen 4′ pieces. This will give you your 36″ planks and part of your 1′ set at the same time. Cut six two-footers in half to make the other dozen one-footers needed.

Now set the fence at 6″ for the final cut. Running two dozen two-footers through will give you your 18″ planks and half your 6″ ones. For the rest of the 6″ planks you can cut up three more four-footers. You'll have six extra 4′ lengths left at the end.

Notching. All pieces have notches one inch deep, cut 2⅝″ from each end. In addition, the 4′ planks have notches midway between the ends. The notches should be slightly wider than the thickness of the plywood you're using. But remember that it's a lot easier to make the notches bigger later for easier fitting, than smaller if they're too loose. Sets for small children should fit fairly loosely so they can put them together easily. Those for bigger kids can be made tighter to provide greater rigidity.

The one critical dimension in the whole set is the distance between the notches. If this varies even a little from plank to plank the pieces won't fit together. If your planks of each size are all exactly the same length, making the notches the same distance in from each end will work fine. But if your planks vary slightly in over-all length, use the jig shown in the accompanying pictures to keep the notch distance uniform.

Clamping a bundle of planks together will let you notch a lot at the same time—but you may find that any timesaving is eaten up by clamping and unclamping. Whichever way you do it, you'll want a wooden extension on your miter-gauge head to help hold the planks in place. This also keeps the back edges of the notch from splintering as the dado head bites through. Be sure the notch in the backing is no higher than the notch you're going to make.

Finishing. You'll want to sand the planks to remove rough edges. Edge holes, left by knots in the core layers of plywood, should be plugged with composition wood so water doesn't gather in them. It's also a good idea to varnish or paint the planks for long life outdoors, but you'll have to sand the notches wider first or they'll jam. Incidentally, wax in the notches will help fitting.

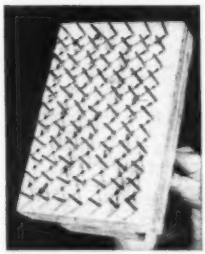
Once the kids have succeeded in getting the pieces away from you, they'll turn out some astonishing structures. But of course father has to help out with a little creative imagination. Personally, I'm proudest of the little combination of a frontier blockhouse and Italian villa I ran up the other weekend. But if I can only keep the kids from sneaking away the planks I'm sure that next Saturday I can do even better. Just let me show you. You see you take four four-footers like this, and . . .

Look out, it's catching. And after all why should the kids have all the fun—especially when they're not really old enough to appreciate it? END

Car Mats Make Boat Pads

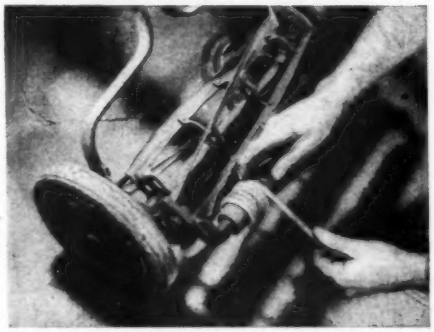
Two inexpensive rubber car mats on the floor of your rowboat will protect the paint and provide a nonslip surface for your feet while rowing. Rubber cement on each corner of the mats will keep them in place.—*R. M. Woodbury, Natick, Mass.*

Lawn Aerator Sets Grass Seed



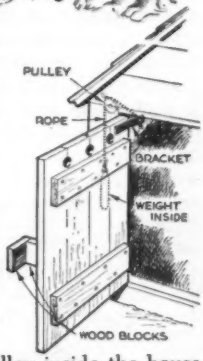
A LAWN aerator, quickly made by driving nails through a board, will help set newly sown grass seed and keep it from blowing or washing away. The seed is spread evenly and the ground tamped with the aerator. A light sprinkling then washes the seed into the hundreds of tiny holes where it is safe from birds, wind and rain.

Rope Helps Cut Grass High



A LENGTH of clothesline wrapped around the roller of your lawn mower will enlarge its diameter, permitting you to cut the grass extra high during the hot midsummer months. This will keep the roots shaded so that the sun can't burn out the lawn. Wire staples, driven into the roller at intervals, will hold the clothesline in place.—*Floyd McGuckin, Ridgewood, N. J.*

Dog Opens Door Himself



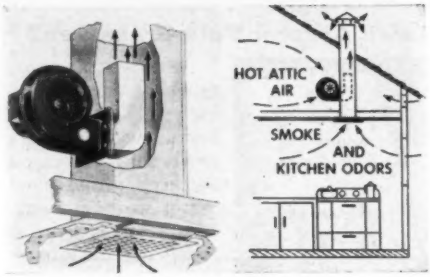
OUR cocker spaniel just nudges the door of his house with his nose when he wants to get out of the rain—two wood blocks mounted at right angles make it easy for him. On the inside edge of the door I fastened a flattened angle bracket. A length of rope is attached to the bracket, then passed over a pulley inside the house. I weighted the free end of the rope to make the door swing easily on its hinges.—*John J. Rea, Urbana, Ill.*

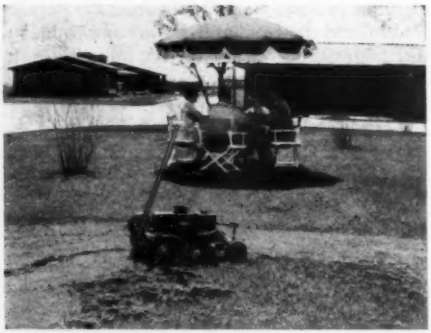
Initials Identify Beach Toys

TEARS and tempers will be saved at the beach if you identify the children's water toys so that there can't be any argument over what belongs to whom. It is easy to do with a patching kit. Just cut initials out of a patch and cement them to the toy.—*Will Thomas, Buffalo.*

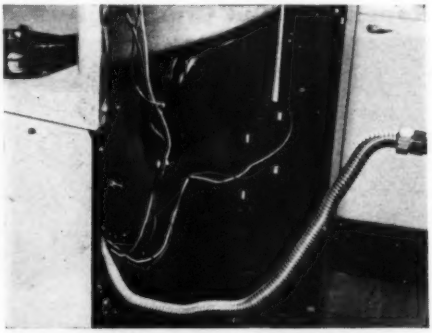
New for the Handy Man

1. Fancy Fans Cool House. The chimney above blows air instead of smoke. Housing an exhaust fan, it draws hot air from the center of an attic instead of one end, providing more even cooling of the entire house. It's also said to permit a small ceiling louver in each room instead of one big central opening that's harder to frame. The housing fits between standard-spaced rafters (right above), can be cut to any roof pitch and has built-in drains. Louvers open when the fan is on and close when it's off, making a watertight seal. The fan at right exhausts hot attic air and kitchen odors at the same time. Installed in any new or existing ventilating duct that's 6" or larger, it pulls attic air in through the blower and creates an updraft that draws out cooking smoke from below. The fan can move 2,000 cubic feet per minute.

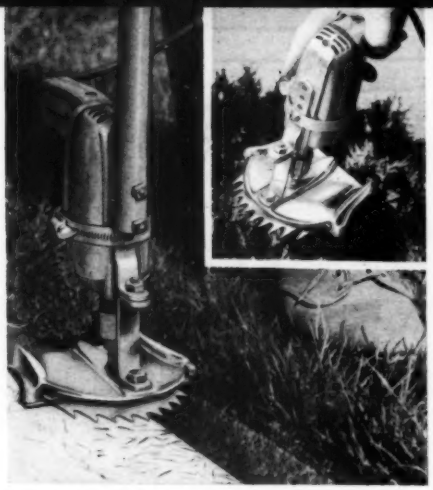




2. Robot Mower Follows Grass. Just start this mower around your lawn and you can concentrate on the card game. The mower will continue on by itself, following the uncut grass with a feeler bar on the front. Cuttings are thrown to one side so they are recut into a fine mulch that need not be raked. When all the grass is cut, you'll have to put down your cards long enough to turn the gasoline-powered mower off.

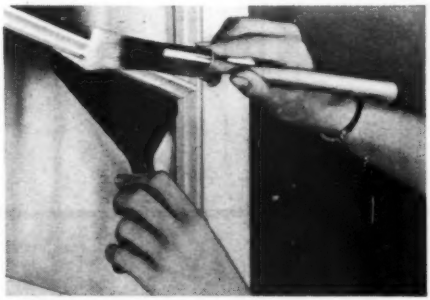


3. Flexible Pipe Connects Range. This flexible brass hose lets you move a range out from the wall for easy cleaning behind it without disconnecting the gas line. It moves several feet in any direction without danger of kinks or leaks, also making it possible to rearrange kitchen appliances without altering the plumbing. The hose has threaded ends so that it can be attached to standard pipe connections with a wrench.



4. Lawn Edger Fits Drill. Any ¼" electric drill will power this grass-trimming attachment. The rotary blade is chucked in the drill and the cutter's frame clamped to the drill housing with a metal strap. The drill can be held in the hand for trimming hedges and bushes (inset) or a handle attached for use as a lawn edger. A toothed guard picks up grass ends so they can be easily cut and also prevents the blade from being damaged by stones.

5. Floor Tile Needs No Cement. You can put these plastic tiles right down over a wood or concrete floor without adhesive or other fastening. Waffle-like pockets in the underside create suction that helps hold the tiles down and provide air spaces for added insulation. The tiles are also kept firmly in place by a slight wedging action between walls. Twice as thick as ordinary tiles, they are said to be 10 times as resilient. They come in 16 colors.

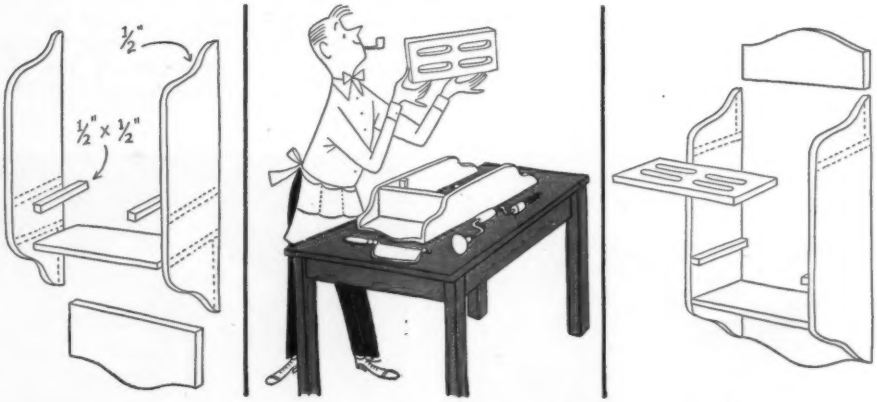


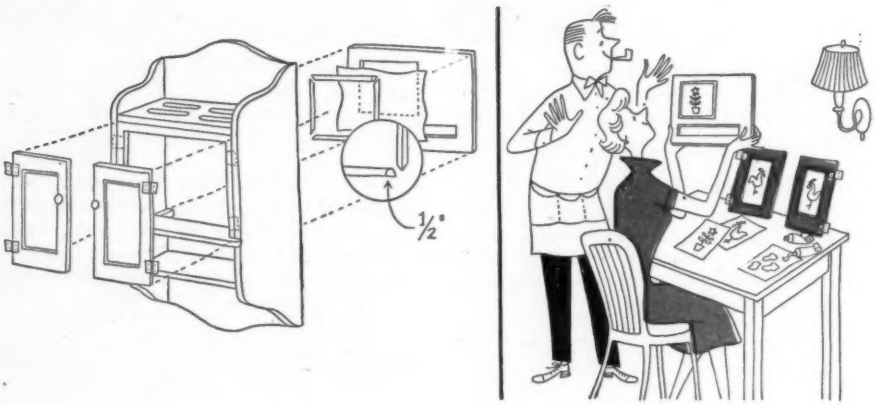
6. Paint Guide Can't Smear. You can slide this painting guide right along a window sash without wiping it clean after each stroke. Tiny pads under the plastic blade raise it slightly, preventing adhesion that often draws paint under the edge and onto the glass. The blade also has a slight curve in it that flattens out when pressed against the sash, then snaps back when the blade is released, making a quick, clean break that keeps paint from smearing.

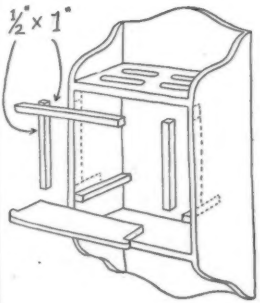
7. Pavement Comes in a Bag. You just empty out a bag of this ready-mixed asphalt, rake it out, roll it and you have a finished pavement in a few minutes. It requires no heating or mixing and can be laid directly on the ground for walks, terraces and tennis courts or over a gravel bed for driveways. The mixture comes in two grades, coarse and fine, and can also be used to patch or resurface old paving. Each 100-lb. bag covers eight square feet 1" thick.

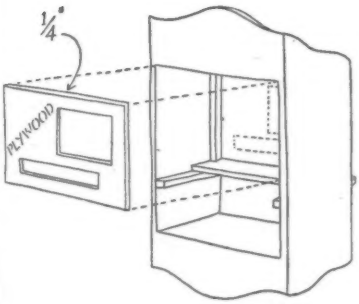
Further information on these products can be obtained from: 1. Loren Cook Co., 664 Front St., Berea, Ohio (chimney fan); Selectric Products Co., 2803 Los Flores Blvd., Lynwood, Calif. (attic-kitchen fan); 2. Fairbanks, Morse & Co., Fairbanks-Morse Bldg., Chicago 5; 3. Techniflex Corp., Port Jervis, N.Y.; 4. Bertram Engineering and Supply Co., 3125 Harrison, Kansas City, Mo.; 5. Robbins Floor Products, Inc., Tuscumbia, Ala.; 6. Thoss Mfg. Co., 206 W. Third St., North Manchester, Ind.; 7. Package Pavement Co., Carmel, N.Y.

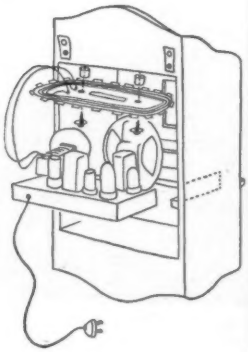
Wordless Workshop











See PSM next month for another Wordless Workshop.

There's more to it than push-pull, click-click, but these

Installing a Rebuilt Engine

Is a Weekend Project

1 Removing hood. All Bill had to do was take out two bolts at front and at rear, and lift it off. On some older models of cars it also would have been necessary to remove radiator brace rods and hood side panels.

two amateur mechanics did the whole job in 24 man-hours.

By Wesley S. Griswold

WHEN an engine starts to grow old and tired, a lot of car owners nowadays order a rebuilt engine. Some of them install the engines themselves. It's not as easy as painting screens; on the other hand, it doesn't require a trained mechanic's know-how.

Take the example of William Ahlstrom of Dalton, Ill., the proud and careful owner of a 1947 Dodge sedan. A few weeks ago, when Bill's original engine had begun to show its age—57,492 miles—he ordered a rebuilt engine from Sears, Roebuck, which happens to sell more of them than any other company in the U.S.

Neighbor Helps

The crated engine arrived on a Friday. By Sunday evening, after a total of 12 hours' work during the weekend, Bill and his helpful next-door neighbor, young Bernard Corbin, had the rebuilt engine in place and running, and the old engine bolted into the return crate to ship to Sears, Roebuck for $23 credit.

They were no better mechanics than the average, though both had fooled around with cars ever since they had first owned one.

But they did have three special advantages: a two-car garage to work in, a small hydraulic jack and a professional-size hoist, borrowed from a friend with a small trucking business.

If you plan to install a rebuilt engine in your own car, you could get along all right with these three substitutes: a back yard, blocks in place of a jack and a heavy rope sling suspended from a sturdy tree limb. (Be sure it's sturdy; this Dodge engine weighed 430 lb., and a Ford V-8 tips the beam at about 455 lb.)

Tools Were Simple

Bill and Bernie used the following tools: a ⅜″ ratchet wrench with a 6″ extension, 9/16″ and ⅝″ wrenches with open and box ends, ⅜″, 7/16″ and ½″ open-end wrenches, side cutters, long-nose pliers, chisel, hammer, screwdrivers and a big crescent wrench.

If Bill had been changing engines in a Ford or Chevvy, he'd probably have left the transmission in place. This would make the job of shoehorning it out and in somewhat easier, though it would have left him with the fussy task of sliding the splined shaft into place on reassembly. If he hadn't been able to borrow the tracked hoist, he'd probably have used the classic shade-tree ritual: pull the engine up, roll the car away, let the engine down, switch blocks, and do it again.

Bill let us bring along a photographer and follow the job, step by step, as he did it. The pictures show how he and Bernie went about it.

2 Lifting out radiator. Bill and Bernie first drained it, then disconnected top and bottom hoses and took out six bolts, three to a side. On older models it would have been advisable to remove bumper, grille and fenders also.

3 Knocking out radiator fender. Bill chiseled off the six rivets that held it. (Small bolts will hold it in later.) Now there was plenty of room in which to lift the engine forward, even with the transmission attached.

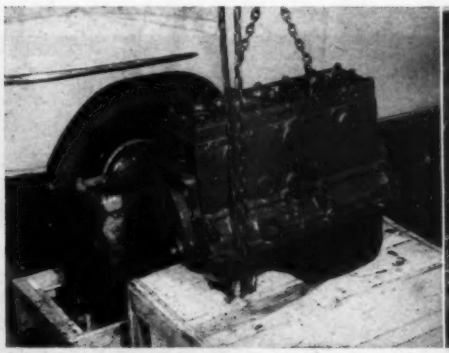
Please turn the page for more engine photos.

4 Removing engine-mount bolts. The ratchet wrench and extension came in handy here. Next Bill took off the fan. Bernie meanwhile was disconnecting gas and oil lines, heat indicator, air filter and accelerator linkage. But most engine accessories were left on for the moment.

5 Removing vibration damper. This meant taking out six bolts with ratchet wrench, removing fan belt and pulley. Meanwhile Bernie was disconnecting starter, coil and generator wires and battery ground cable, also removing bolts connecting exhaust to manifold.

6 Disconnecting drive shaft from transmission. While Bill was under the car, he also disconnected emergency-brake cable, shift and clutch linkage and speedometer cable. One safe way to get working clearance is to run front wheels up on planks laid flat.

7 Sling is bolted to the head, using the third pair of bolts from the front. With front of engine thus supported, Bill removed rear mount bolts and used a hydraulic jack to take up weight of bell housing. Engine and transmission could now be slid forward and lifted.

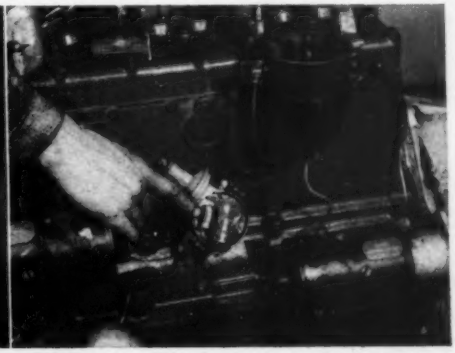


9 Engines are transposed, the old one resting in the crate, the rebuilt one on top. Sling position was changed to balance block without transmission. A rebuilt engine, experts say, may even be better than a new one, because it is seasoned, has no expansion in it.

10 First step of reassembly was sliding the fluid-drive unit onto eight supporting bolts at the rear of the block. Here Bill is driving dowel pin from block into bell housing. Bernie removed protective grease from all bolt holes and surfaces that were to mate with accessories.

8 Ready for dismantling, the old engine rests on the crate containing the rebuilt one. The men then completely stripped it. They scraped dirt and grease off the engine accessories with a putty knife and then washed the parts clean with solvent, which was not allowed to get inside starter, generator, distributor, or fluid-drive unit. The big thing, as always in taking anything apart, was to remember what was what and where it went. Bill and Bernie made an effort to keep bolts grouped together with their parts.

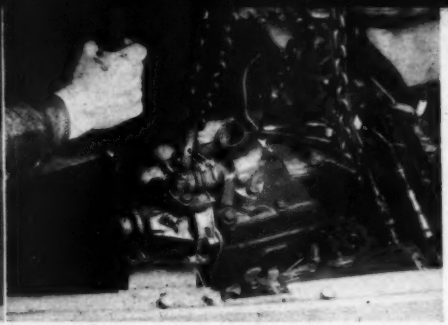
11 Adding the transmission, its splined shaft being inserted into the clutch assembly and fluid-drive unit before its housing was bolted to the bell housing. Six bolts do the job. A fussier man might have cleaned off the transmission before putting it back on.



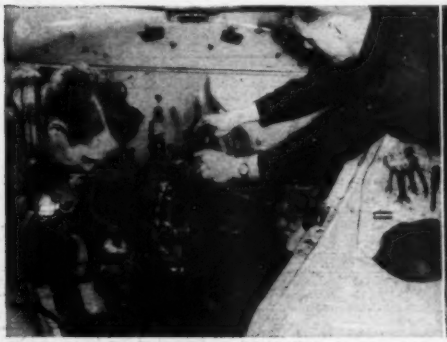
12 For correct timing, Bernie held thumb on No. 1 spark-plug hole while Bill cranked engine until Bernie felt compression and saw that timing pointer was lined up. Then Bill inserted distributor with rotor in position to fire on No. 1.

Please turn the page for more engine photos.

13 **Easing the rebuilt engine in,** after attaching most of the cleaned original outside parts. Sling is now back in its original position, so that the transmission will tip downward and rest on the hydraulic jack. Bill and Bernie put in new clutch throw-out bearing, spark plugs and oil-filter cartridge, and used a tune-up kit to rejuvenate the old distributor.

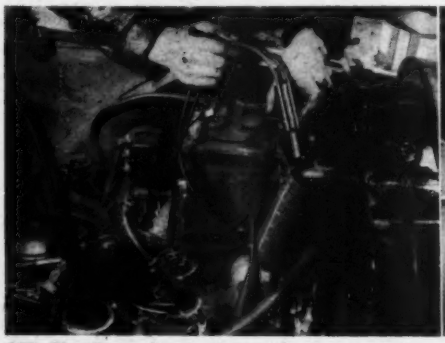


14 **With the help of a pry bar,** Bill eases the rebuilt engine onto its mounts. The chain still holds most of the weight. Bernie was under the car by the hydraulic jack, making sure the bell housing didn't push the rubber mountings off the frame's front cross member. With a little horsing, the engine lined up dead true on its mounts.



15 **On the home stretch,** Bill hooks up the flexible gas line to the fuel pump, which had had to be replaced. He had also installed new gaskets. Bernie is busy with the accelerator linkage. The washed-out air cleaner and new radiator hoses are all that have to be put on.

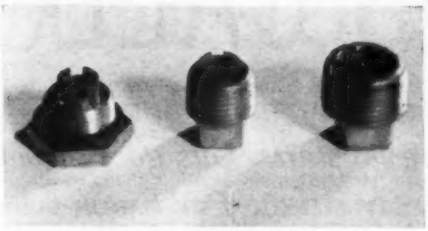
16 **Thoroughly cleaned** and spruced up, the radiator is slid back into place. Bill had sprayed the tank with a thin, quick-drying varnish on Saturday afternoon. Small bolts with lock washers under the nuts replaced the rivets cut from radiator fender.



17 **Checking the timing** with a neon timing light. The crankcase was now full of clean oil and the radiator filled. The timing needed only slight adjustment. When the engine was warmed to 160°, Bill checked all the head bolts again for tightness.

18 **The road check was okay,** and Bill waves a happy goodbye to the kibitzers who had watched him and Bernie switch engines on the '47 Dodge. Bill has to remember that he must drive the rebuilt engine as carefully for the first 1,000 miles of use as the engine of a new car.

Products for Your Car



Magnetic Plugs Clean Oil

MAGNETIC plugs are now available for full protection of your car's lubrication. Here is a typical set—for the crankcase, transmission and rear axle. Each plug has an Alnico magnet to attract iron particles from the oil or lubricant stream. The plugs cost about $2 a set. *Magnetic Drain Plug Co., Wellington, Ohio.*

Safety Belt Secures Door

THIS safety belt is designed to keep car doors closed in case of an accident and prevent occupants from being thrown out. One end of the belt is attached to the door, the other to the floor. When doors are kept closed, a car body also retains maximum structural strength, affording greater protection to the occupants. *Karbelt Mfg. Co., Mason, Mich.*

Vacuum Turns Off the Lights

IF YOU tend to forget to turn off your parking lamps after using them in a fog or early morning light, this vacuum switch will protect your battery from being run down while you are at work.

Hooked up to the vacuum line and the parking-light circuit, the unit will automatically cut off the lamps from 30 seconds to two minutes after the ignition is turned off. Engine vacuum automatically restores the circuit when the engine is started again. *Cogg Manufacturers, Inc., 16 W. 4th St., Tulsa, Okla.*

Bug Juice Sold in Bag

HERE is a liquid that was developed especially to help automatic windshield washers clear away the insects that often splatter the glass during summer driving. A transparent plastic envelope contains two ounces of it, enough to treat a washer jar of water. You snip off one corner of the envelope and pour the fluid into the jar. The product also serves as an antifreeze to keep the washer fluid from freezing on the windshield. *Vizo Sales Co., 1937 Book Tower, Detroit 26.*

GUS CALLS

With two strikes against him before he starts, Gus goes to bat for three old codgers in a wheezy sedan. **BY MARTIN BUNN**

GUS WILSON'S rugged features lit up with a broad grin as he spotted the three old codgers pushing the battered sedan down the street toward his garage. Pete Blinstock was shoving on the rear, while Tom Hanratty bent a shoulder to a flapping fender. Ezra Hendricks, his gray beard thrust out belligerently, was at the wheel.

Stan Hicks, Gus's helper, ran out from the grease rack to give the three farmers a hand. Hendricks spun the wheel and the sedan rolled into the Model Garage.

"You boys out for a little exercise?" Gus asked, innocently.

"Exercise!" Ezra Hendricks' beard fairly bristled with indignation as he popped out of the car. "Pete and Tom, here, have been accusing me of busting up my own car. The old fools."

Pete Blinstock was puffing as he came around the car.

"Everybody knows," he wheezed, "that our team is going to beat the pants off Stanfield Corners today. Ezra insisted on taking us to the game in his car. Then he pulled something loose so we wouldn't get there."

The Old Car Gave Out

"We couldn't coax another pop out of her," put in Tom Hanratty, tugging his watch from his pocket. "Hendricks tramps on the starter until the battery's dead, and here we are. If we miss that game— Gus, you've got to fix this thing up!"

Gus wiped the grin from his face as the seriousness of the situation dawned on him. This might be just another Saturday to some folks. But it was "the" day to these old codgers. The local Little League baseball team was about to play Stanfield Corners for the county championship. On the Stanfield nine was Ezra's grandson, Frank. Stacked against him were Sammy Blinstock and Clyde Hanratty—grandsons of Pete and Tom. The three proud old rooters were

Stan Hicks ran out to give the three old farmers a hand, and the battered sedan rolled into the Model Garage.

A CLOSE ONE

taking the game as a personal matter, and they had very little time to make it to Stanfield, 40 miles away.

Gus glanced at the clock and made a rapid calculation. He knew this old car like the palm of his hand, and the trouble shouldn't be hard to find. Yet a feeling of apprehension ran up his spine. Baffling situations had a way of cropping up at times like this.

"Slap in a rental battery, Stan," he told his helper, "while I start checking the ignition."

Gus moved fast. He removed the distributor cap, put the car in gear, and rocked the points up on one cam of the distributor rotor shaft, to open them wide.

The points were slightly pitted. He smoothed them with a point file, and checked the gap with a gauge. A little off. He loosened the lock screw on the movable point, wiggled the eccentric screw back and

forth until he had the right gap, and tightened the lock screw again. As he stepped back to see how Stan was getting on with the battery change, he collided with the three anxious grandfathers.

"Find it, Gus?" Hendricks asked hopefully.

"Of course he didn't!" Hanratty snorted.

Gus Wilson's eyes twinkled.

"Give me room, boys," he chuckled. "Is the battery in, Stan?"

"All bucked up, Gus."

"Turn on the ignition switch."

Gus rocked the points back off the rotor cam, jerked the high-tension wire from the center of the distributor cap, and held it a quarter-inch from the engine block, snapping the points with his thumb. Spark flame arced across the quarter-inch gap. Gus frowned. The blue color of the flame, its husky width, and the audible snap it made, told him that coil and condenser were right. This wasn't ignition trouble, unless it was a matter of timing.

"How'd she act when she quit?" he asked. "Did she backfire?"

"No," grunted Hanratty. "She just sort of wilted and died."

"She'd perk up a mite," Hendricks added, "when I pulled out the choke."

"That," declared Blinstock, "was before she conked out for good at the edge of town."

Gus stroked his chin for a moment. "Step on it, Stan," he told his helper.

While Stan ground the starter on a motor that was as dead as last Sunday's pancakes, Gus loosened the clamp on the air filter and lifted it off. Taking a squirt can of gasoline from the bench, he shot a thin stream of gas down the carburetor throat. Instantly the motor sprang to life. It died as Gus put the can back on the bench.

"Gas trouble," Gus breathed.

The gauge showed full. The trouble must be in the fuel pump. Gus disconnected the copper tubing from the pump outlet to the carburetor, removed the two cap screws that held the pump to the side of the engine block, and pulled the pump clear. This exposed the pump arm that worked on the eccentric on the camshaft, yet left the pump attached to the gas line from the tank. When he pumped the arm back and forth by hand, a stream of gas shot forcibly from the pump outlet.

Gus grunted, and twisted the pump around so he could see the bottom of the pump arm. In the past he'd been fooled by pumps that threw gas when worked by hand, yet failed to do so when attached to the engine, because arm wear had shortened the stroke. The pump arm showed no wear. It didn't add up. No gas to the engine. Yet the fuel line was clear, and the pump arm was working perfectly.

A FEATURE of the 1901 Auto Show was the "Auto-Quadricycle." Two passengers lounged in upholstered case, while the chauffeur sat on a little raised seat at the rear.

"Maybe," Blinstock said, "we ought to hustle out and hire a car to take us on to Stanfield."

"That," declared Hanratty, "is what we should have done in the first place."

"We've still got an hour," Hendricks said weakly.

"An hour for 40 miles!" exploded Blinstock. "Why you old faker, you know your car won't do 40 miles an hour."

Hendricks flushed.

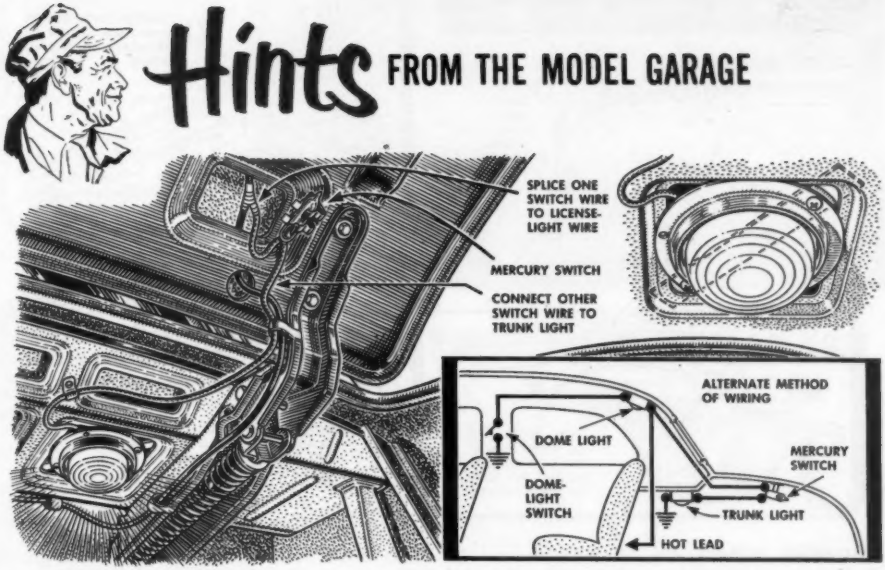
"Now look here, Hanratty," he sputtered. "My car'll do 60, once she sets her mind to it."

Gus kept his head discreetly under the hood. It wouldn't look well for the Model Garage if the three old fellows had to hire a car to take them to the game. But this thing was getting bad. No water showed in the sediment bowl of the gas pump. He checked the screen at the gasoline inlet of the carburetor. Gas line clear, screens clean, pump in good working order. Yet no gas was reaching the carburetor.

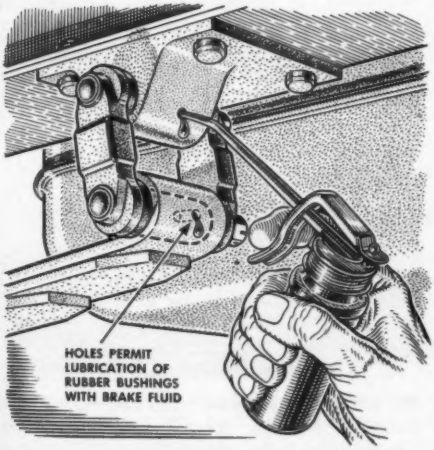
Gus's mind went back over each check

[Continued on page 240]

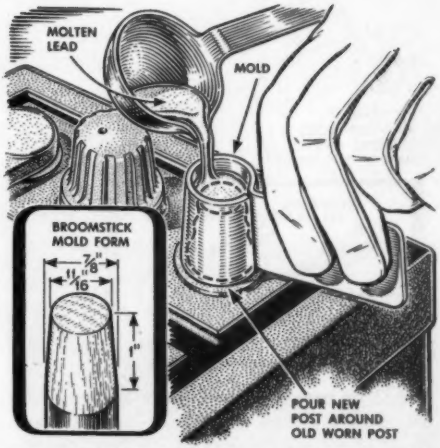
Hints FROM THE MODEL GARAGE



A lamp that lights automatically when you lift the trunk lid can be installed with parts that cost around a dollar. A mercury switch will take care of turning the light on and off. A flush-mounted clearance lamp with a clear lens is a good choice for the light. It usually can be set into a recess in the lid or body bracing by placing a metal strip back of the opening and running sheet-metal screws through the holes in the flange. The strip or lamp must contact bare metal for a good circuit. If it is connected to the license-light wire, the lamp will come on only when the car lights are on. In the alternate method, the lamp will operate independently.



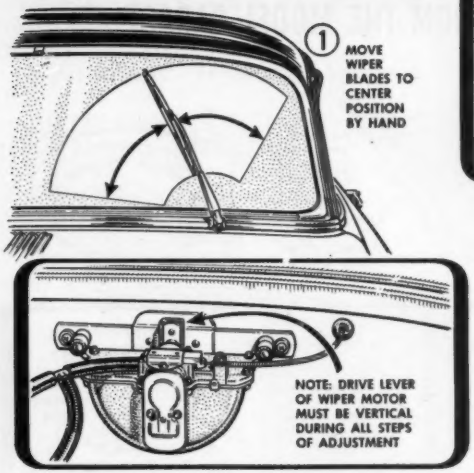
A persistent squeak in a rubber-bushed spring shackle usually can be eliminated by drilling a hole into the bushing and forcing in brake fluid with a pump oiler.



If a battery post is so worn the cable won't hold, cast a new post around the old one. Make a form by shaping aluminum around a broom handle tapered as shown.

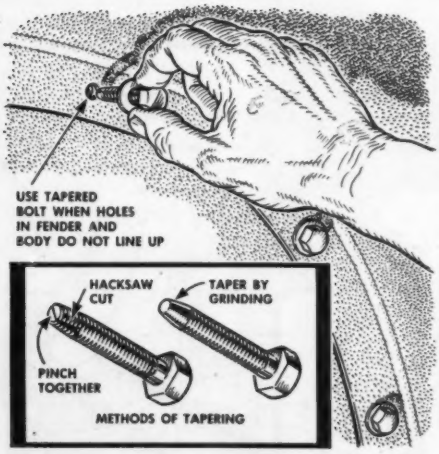
Please turn the page for more auto hints.

MORE Hints from the Model Garage

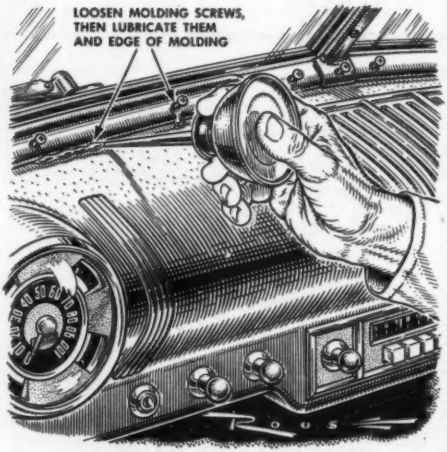


Sluggish wipers can often be traced to cable drives that are too tight. The remedy is to slack off the cables a trifle.

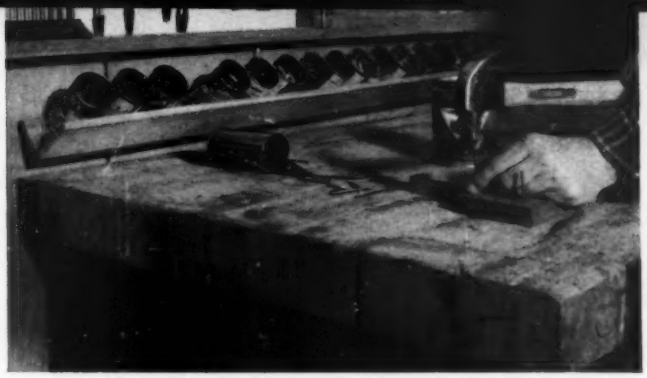
Center the wiper arms by hand (upper left), bringing drive lever to vertical position (lower left above). Remove wiper arms and loosen screw at end of wiper shaft about ¾ turn (upper right). Pinch the cables together (lower right above) until you hear the serrations in the wiper drive slip one notch. Tighten the shaft screw and repeat this operation on the opposite shaft.



If one or more of the fender holes do not line up with those in the body when a fender is being installed, taper the ends of the bolts by one of the methods shown. When the bolt is pulled tight, the taper will force the holes into matching position.



An annoying squeak often develops in the molding that fits between the instrument panel and windshield. You usually can get rid of it by loosening the screws and squirting penetrating oil containing graphite on the screws and under the molding.

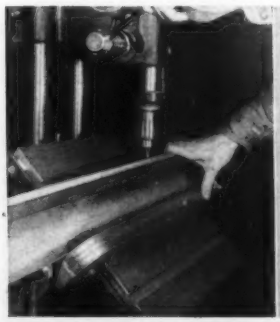


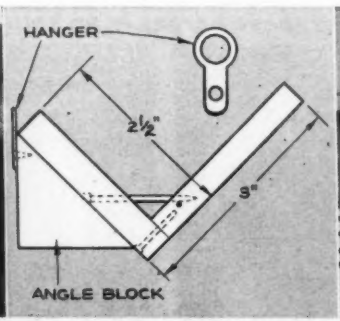
Keep things sorted and save pick-out time with a can rack like this. Dividers keep each can in its place and prevent tipping when neighboring ones are out. The contents of each may be identified with lettering on the edge of the rack facing the user.

Racked Juice Cans Help Keep Your Workbench Neat

Our shop is less cluttered and the workbench easier to keep clean since we put empty juice cans to work. The long rack above holds more than two dozen of them, at an angle that makes it easy to see what's in them—nails, screws, hooks, fasteners, washers or what have you.

Frozen orange, grape, lemon and other juices all come in cans this size, so it is easy to collect as many as you need. If you prefer a vertical arrangement, short rack sections can be mounted one above the other in tiers, perhaps between two studs.—*Darrell Huff, Sonoma, Calif.*



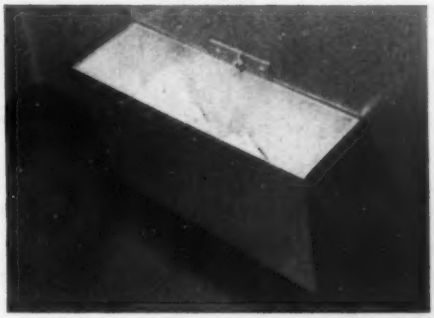


Two strips of ½" lumber 2½" and 3" wide are nailed together as in the drawing above. Finishing nails are driven through the 2½" strip at intervals of 2¼" as dividers. Predrilling nail holes at 45° as above makes this easier. Angle blocks about 2½" on the long face, which can be cut from a scrap of two-by-four, are nailed to the back strip along its top edge as at right above. Small shelf hangers screwed to these make it easy to hang rack on a wall.

Wall Wastebasket Makes Your Workshop Easy to Sweep

The ordinary shop wastebasket has to be lifted when you sweep, and shows a knack for getting underfoot just when you're juggling a four-by-eight plywood panel.

This one, fastened 4" above the floor, on a wall, is never in the way and need not be moved except for emptying. It was made by nailing a front and back of thin composition board to a bottom and ends cut from heavier wood. The back extends a bit past the bottom to fit into a grooved cleat fastened to the wall. A turn button engages the top.—*Will Thomas, Buffalo, N.Y.*



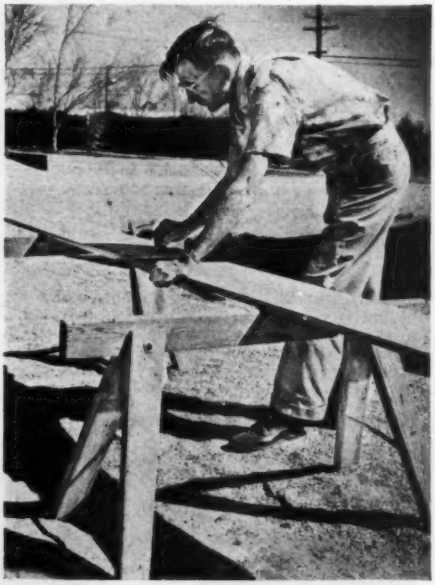
These Sawhorses Do Anything

By Edwin M. Love

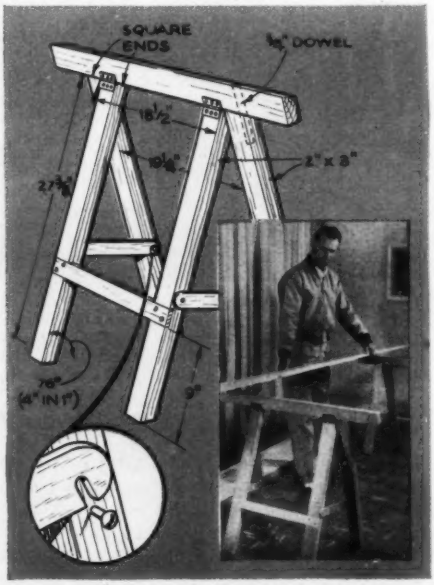
No oat burners, these ponies will earn their keep in scores of jobs around the home, shop and garage. They're fun to build, too.

YOU can make sawhorses become the real work horses around your home and shop. Besides holding wood for sawing, modern horses do everything from supporting scaffolds to propping up your car. Some tote their own tool racks and special jigs for holding work more easily. Others fold up like a card table for easy storing in a small

You can build either of these horses in an hour or two



Simple but strong, these horses are held together by a single carriage bolt through each pair of legs. The upper ends of the legs are tapered to give the outward splay and are attached with thick casein glue before the bolts are tightened. The cross braces are ½" aluminum tubing flattened at the ends, drilled, and screwed to the legs.



Collapsible horses fold flat for easy storage, make good supports for picnic tables, table-tennis tops and other structures that must be put up and taken down often. One pair of legs is permanently attached to crossbeam with dowels and glue, while other pair is hinged for folding. Spreader strips pivot on screws in hinged legs, hook over screws on fixed legs.

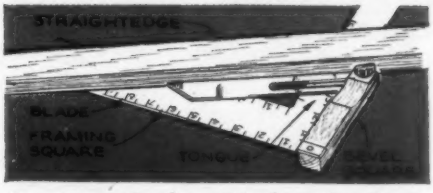
space or carrying in the trunk of your car.

Brackets speed building. Metal brackets, fitting stock lumber sizes, make horses that you can put together in a couple of minutes, then take apart when they're not in use. One set of brackets and some legs of different lengths will build you a picnic table or a hoisting rig as fast as you can change the legs.

Little things make a horse good. When nailing, stagger the nails to distribute the wedging action and reduce splitting. Screws in place of nails will add years of life, as will the use of glue. Chamfering the edges will keep splinters out of you and save wear on the horse. A finish coat of shellac or varnish keeps out moisture and lessens checking.

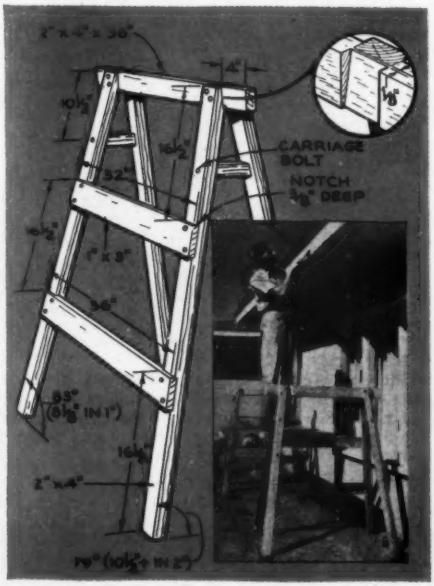
Shown here are basic horses for all purposes. From them you can build up a stable of your own that will take care of nearly any job you have to do.

How to measure leg angles

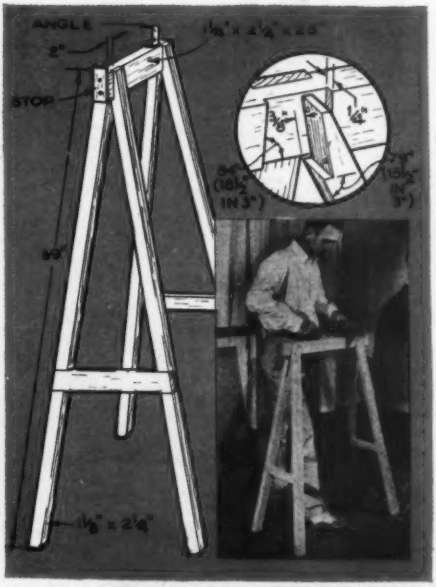


Accurate angles for cutting legs of sawhorses can be measured with a framing square, straightedge and bevel square, as shown above. Lay the straightedge across the framing square, intersecting the larger number on the blade and the smaller one on the tongue. An angle designated as 15″ in 5¾″, for instance, means 15″ on the blade and 5¾″ on the tongue. This produces an angle of 69°. Once the angle is set, the handle of the bevel square is placed against the tongue and the adjustable blade tightened against the straightedge. The bevel square can then be used to transfer the angle to the wood before making the cut. A 45° angle can be made by intersecting any two identical numbers on the blade and tongue, such as 8″ and 8″, 6″ and 6″ and so on. Other angles are given on the drawings.

Long-legged models hold scaffolds and tables



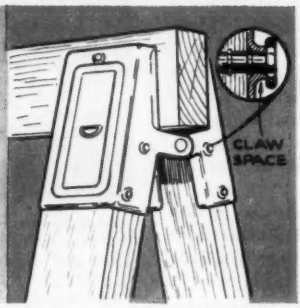
Scaffold horses hold planks at any one of three levels for easy reaching of high places either outdoors or in. By making legs longer or adding extensions, horses could be safely made several feet higher. For maximum strength, top beams and crosspieces should be notched into legs as shown. Spreader blocks that hold legs apart are grooved to slip over the carriage bolts.

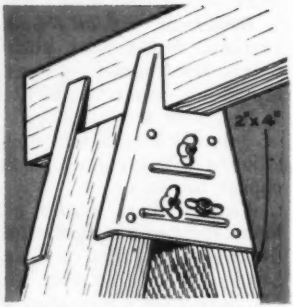


Drafting table is easily made from a pair of these extra-tall horses. Crossbeam, fastened to horses with metal angles, supports back edge of drawing board and gives it proper tilt. Front edge of board rests against wood stops that keep it from slipping off. Without tilting bar, horses make ideal supports for wall-paper-pasting table or elevated work table.

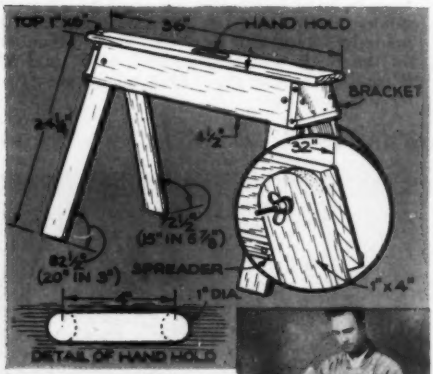
Please turn the page for more sawhorses.

Horses built with metal brackets go together quickly





Self-gripping bracket, made by Dalton, holds two-by-four legs securely to crossbeam by single wing nut (left above). As nut is tightened, bracket spreads, locking in legs and forcing metal teeth into wood beam for a tight grip. Quick-assembly Dalton bracket (center) is nailed to legs and crossbeam, but has flanged holes that hold nailheads extended for easy removal with hammer claw. Heavy-duty Larson bracket (right) has solid sides for rigid bracing, is clamped to legs by three bolts and can also be nailed for extra strength.

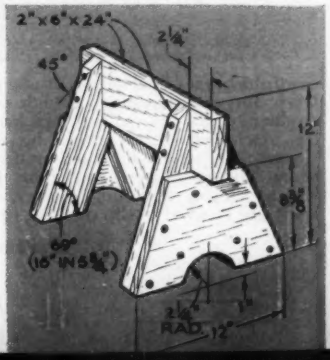


Folding horse has legs that swing up into side rails for easy storage. Rails are held together by metal Larson brackets screwed on at ends, and each leg pivots on a single 3" carriage bolt. Spreader strips, screwed on inside of rails, lock legs against end plates when nuts are tightened.

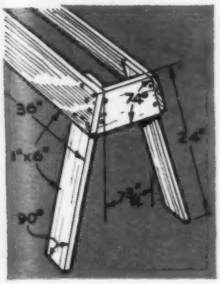
Hoisting rig is simply an overgrown sawhorse made with conventional metal brackets and extra-long legs. Temporary braces are nailed to legs to avoid spreading, while planks wedged against each end prevent sway.

Husky, short-legged ones shoulder heavy jobs easily

Midget horse, designed by F. Shelford of Los Angeles, makes a safe, solid support for holding up a car while you're working under it or switching tires around. Wide, 1"-thick side braces make sure that legs can't spread apart.



Horses you can saw through make big cutting easier



Hollow horse lets you saw, drill or drive nails down between side rails, giving solid support at both sides of work and lessening chance of cutting into the beam or legs. Horse was designed by Charles Kimball of Los Angeles.

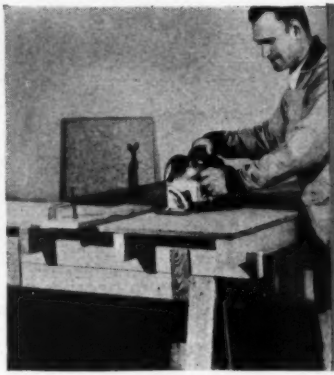
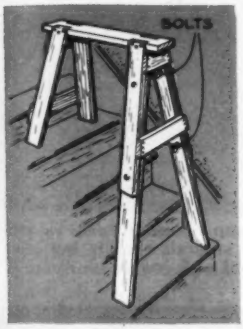


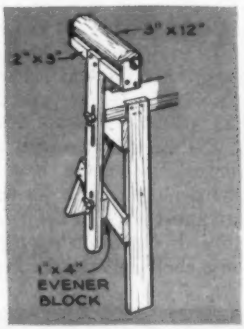
Table horse, designed by W. G. Waggoner of Sacramento, Calif., makes it easy to saw large sheets of plywood without calling the Marines to help you hold them. Two ordinary horses are joined with four two-by-four bars 8′ long, forming a 4′-by-8′ trestle. Ends of bars fit in notched beams attached to horses. For lengthwise cuts, clamp guide fence to panel and saw between bars. For cutting across a panel, lay down cross strips to raise blade so it will clear bars.

These accessories get more work out of any horse

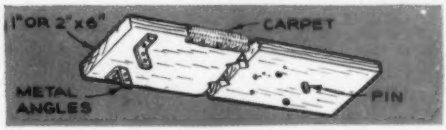


Extension legs adapt a horse for working on stairs, sloping ground or other uneven surfaces. To make length adjustable, you can add series of bolt holes 1″ or 2″ apart, but avoid a slot-type, sliding arrangement that might let go with you on it. For extensions longer than 2′, nail on extra cross braces at bottom to keep legs from spreading.

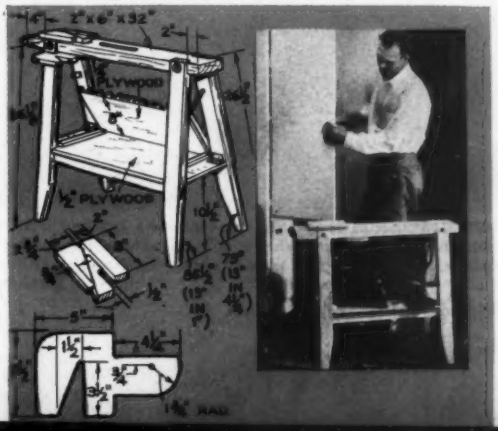
Ripping roller, mounted on the end of a horse and adjusted to the height of your saw table, gives you a third hand for holding long boards while you run them through a saw. Slots in support permit it to be raised and lowered quickly.



Padded rail, slipped over regular crossbeam, keeps scratches off finely finished pieces. Wrap old carpet around board and tack edges underneath. Metal angles hold rail on beams set on edge. For beams turned flat, use several dowel pins.



Tools are at your fingertips when kept in a folding rack like this one under the sawhorse. Rack is hinged to back edge of shelf, and shelf, in turn, is hinged to legs so both fold up flat against hardboard back when leg bolts are loosened. Front edge of shelf rests on stretcher notched into legs, and rack is held at angle by short chain. Wedge-type stop mounted on top of beam holds small work for planing or jointing; pivoted side stop swings out from under beam to take doors and larger pieces. End of crossbeam is rubber-padded so horse can be braced against wall without marring wall.



Extra Jobs for Your Portable Sander

ETCHING GROUND GLASS for camera. Strip of sheet metal is agitated by sander over glass covered with oil-moistened valve-grinding compound or abrasive grit.

A sander is a nice investment—make it pay off by handling jobs other than just plain sanding.

A CRAFTSMAN I know uses his oscillating sander after he has finished one of those long, hard days in his workshop. He takes off the sandpaper (and his shoes) and lets the machine massage his tired feet.

Portable sanders can do lots of jobs the maker may never have thought of—from sharpening pencils to frosting glass. Here are a few ideas to keep your sander buzzing around your workshop instead of resting idly on a shelf.—*Walter E. Burton, Akron, Ohio.*

TO REMOVE RUST, apply satin finish to lacquered surfaces or smooth shellac between coats, drive steel-wool with coarse sandpaper.

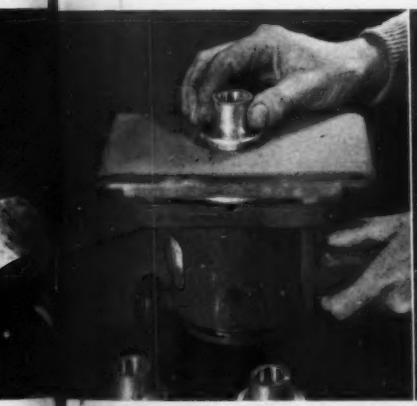
CIRCULAR KNIFE is quickly given new edge by holding it against sheet of metal-cutting abrasive mounted on sander shoe. Knife rotates as it is sharpened.

AX EDGE is restored with disk sander. Coarse abrasive disk is used to remove nicks, fine disk to produce sharp edge, extra fine disk to brighten ax head.

DECORATIVE DESIGNS or monograms can be etched in metal, plastic or glass by cutting stencil from masking tape (left), applying valve-grinding compound mixed with light oil (center) and agitating strip of sheet metal over cutaway portion (right). Design will be ground in before protective tape wears away. After job, wash work with soap and water.

FLANNEL PAD used with mild rubbing compound quickly imparts luster to surfaces that would require lengthy hand polishing.

MACHINE PARTS are brightened in a jiffy by agitating a loose strip of fine abrasive cloth with the sandpaper-covered sander shoe.



HELD UPSIDE DOWN, sander presents a working surface for small freehand jobs. Here turnings are deburred.

PENCIL SHARPENER. Pencils are brought to a needle point in seconds. Pointed tools are likewise renewed.

PAPERHANGER'S ROLLER, roughened by use, is smoothed and crowned by holding it on platen.

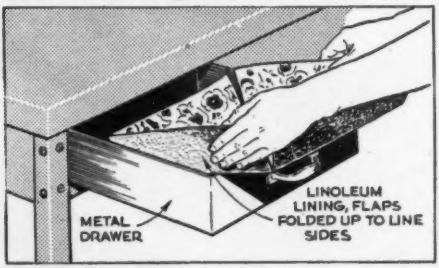
Telephone Can Help Your Radio

If you live in the country and your radio won't quite pull in that favorite station, try this. Connect a wire from the antenna terminal on your radio to a pie tin or any metal disk about 6″ in diameter. Set your telephone on the pan, and you'll be surprised at the difference.

Rivets Lessen Heel Wear

Metal heel protectors can be quickly made from ordinary ¼″ split copper rivets. Hammer them into the heel-nailing holes, and the nailheads will force the split sides apart to lock the rivets in.

Drawer Lining Saves Tools

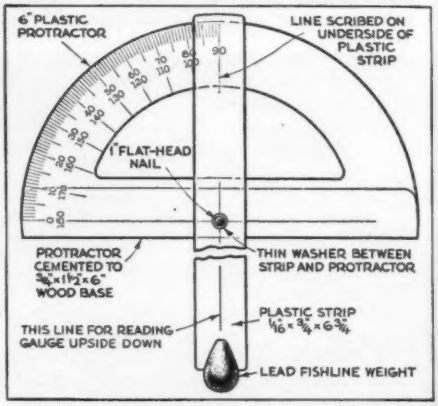


A linoleum lining for your tool-storage drawers will protect cutting edges and surfaces of tools. Deep drawers or drawers holding chisels should be lined on the sides as well by folding up flaps.—*Hugh Lineback, Stillwater, Okla.*

This Paintbrush Turns Corners

For getting into tight spots, a tilt-handle paintbrush can be made by sawing apart an ordinary brush and twisting screw eyes into the cut ends. A machine screw and wing nut join the screw eyes and tighten the brush handle at any angle.

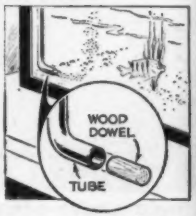
Angle Gauge from Protractor



The correct angle on roof rafters can be indicated by a free-swinging arm mounted on a plastic protractor.

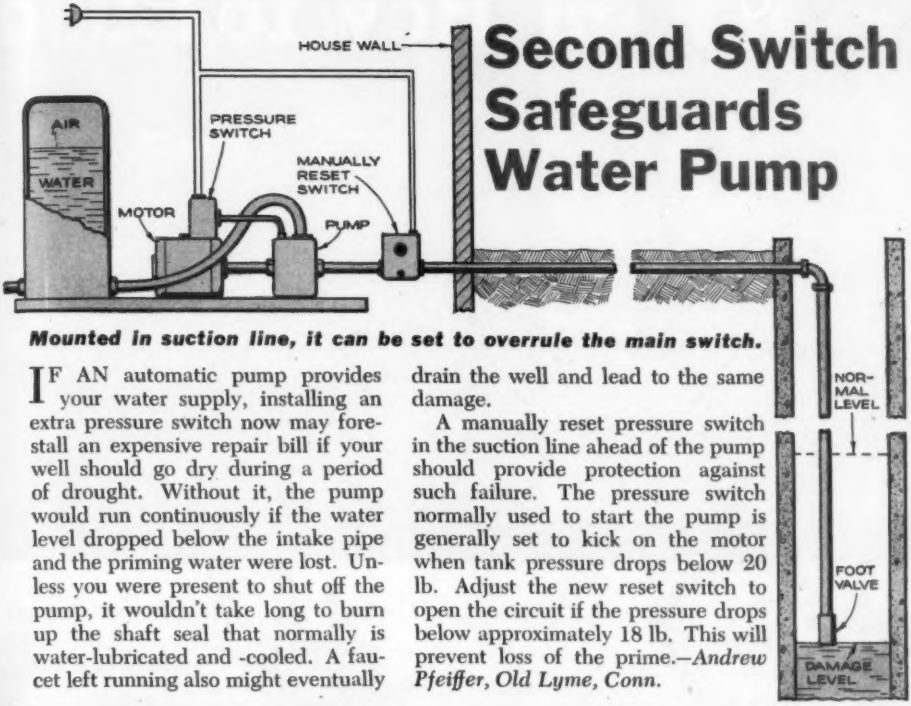
The straight edge of the protractor is reinforced with a strip of wood, and the wire-nail pivot pin is driven into it. A fishline sinker, slotted and cemented to the end of the clear-plastic pendulum, holds the pendulum plumb regardless of the angle of the protractor. Angle readings are shown by a line scribed on the center of the pendulum. —*A. Trauffer, Council Bluffs, Iowa.*

Dowel Aerates Fish Tank



A wood dowel inserted in the tube of an aquarium aeration pump is a good way to get the tiny bubbles of air necessary for efficient oxygenation of the water. Any fairly hard-grained wood will do. Only a little pressure is needed to force the air through the pores of the wood.

Second Switch Safeguards Water Pump



Mounted in suction line, it can be set to overrule the main switch.

IF AN automatic pump provides your water supply, installing an extra pressure switch now may forestall an expensive repair bill if your well should go dry during a period of drought. Without it, the pump would run continuously if the water level dropped below the intake pipe and the priming water were lost. Unless you were present to shut off the pump, it wouldn't take long to burn up the shaft seal that normally is water-lubricated and -cooled. A faucet left running also might eventually drain the well and lead to the same damage.

A manually reset pressure switch in the suction line ahead of the pump should provide protection against such failure. The pressure switch normally used to start the pump is generally set to kick on the motor when tank pressure drops below 20 lb. Adjust the new reset switch to open the circuit if the pressure drops below approximately 18 lb. This will prevent loss of the prime.—*Andrew Pfeiffer, Old Lyme, Conn.*

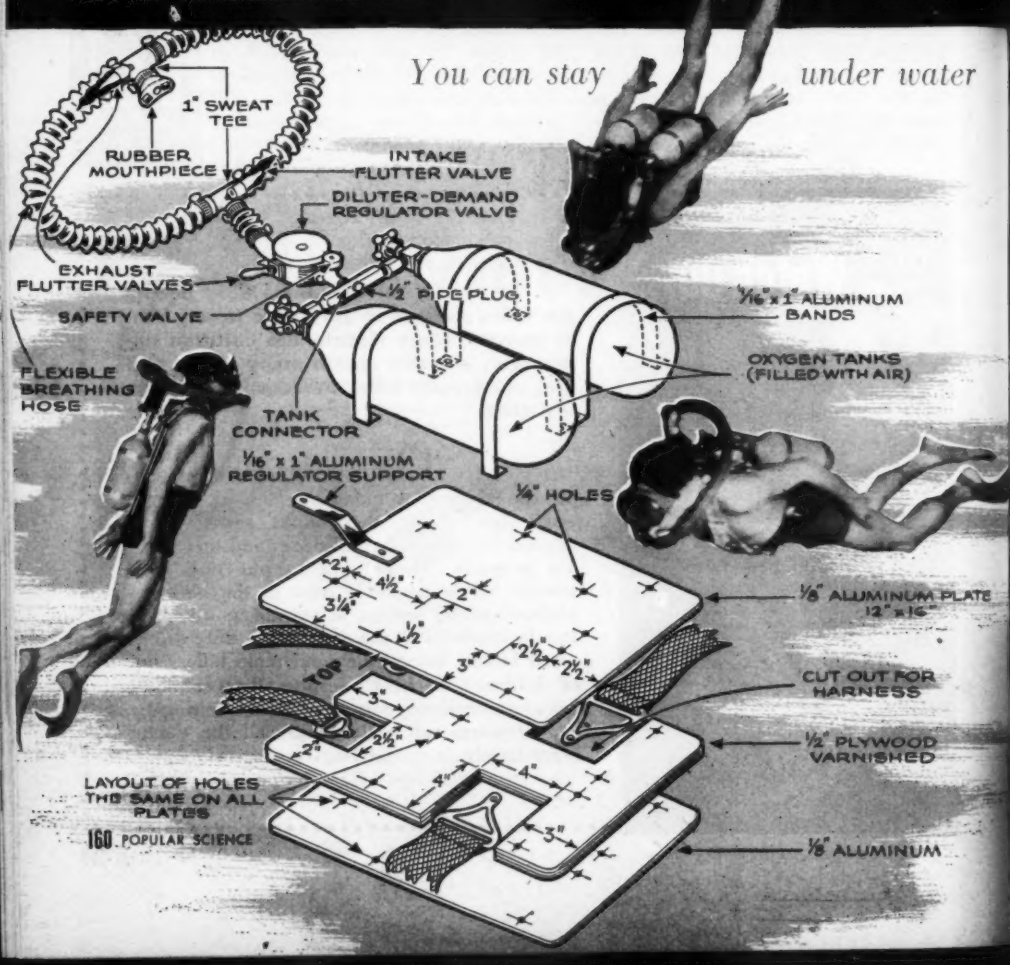
Watch Out... in JULY

for poisons. More people die from poisons in July than in any other month. Most victims are children under four, but this month many adults will die, principally from overdoses of sleeping pills.

ONLY one-third as many people die of poisons today as was the case 40 years ago. Since then, most people have learned **(1) to see that all drugs and medicines are properly labeled; (2) to put tiny bells around bottle necks or pins in the corks of bottles holding poison, as warnings; (3) never to take medicine in the dark; (4) to store drugs, weed killers, insecticides and mole killers out of children's reach. If, despite all precautions, someone swallows poison, induce vomiting by lots of warm salt water, and call the doctor immediately.**

How to Build

COMPLETE OUTFIT costs about $40, not including face mask and swim fins—less if you shop shrewdly or use only one large tank. Weight belt is surplus cartridge belt; pockets contain lead.



and Use a Diving Lung

nearly an hour with your air supply strapped to your back.

By Herb Pfister

FUN UNDERWATER

FOR a brand-new sensation, a feeling of really being out of this world, try the latest thing in water sport—a self-contained diving outfit.

You can make your lung pay for itself, too. One outboard motor salvaged from the mud, or one boat propeller replaced without pulling the boat up on shore, will net you the price of the parts.

Once you become accustomed to breathing air gradually instead of gulping it freely as you do on the surface, you'll swim leisurely and safely below 25 or 30 feet of water. And you can stay down for nearly an hour if you like.

The experience of hunting and exploring under water is yours for the price of a pair of surplus oxygen tanks, an oxygen demand valve and some fittings. After you've rounded up the parts, you can build your diving lung in two or three evenings' time with ordinary hand tools.

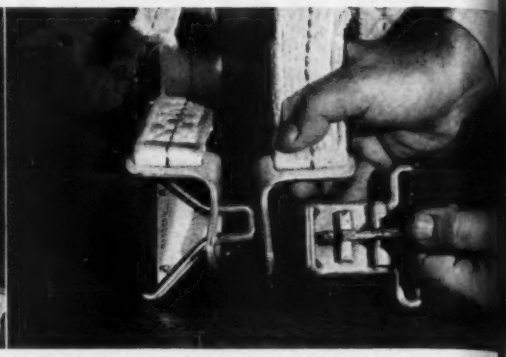
1 **New valves** were fitted to this pair of surplus CO_2 tanks. They came with valveless trigger head, held in hand. Tanks were first flushed clean with hot water to remove all trace of CO_2.

2 **Specifications** are stamped on all high-pressure tanks. Top line gives service pressure (1,800 p.s.i.). Other markings show test dates. Fresh markings show date of latest test, March, 1953.

3 **High-pressure connector,** obtainable in surplus stores or from oxygen-therapy-equipment dealers, joins tanks. It should space tanks one or two inches apart.

(Continued on next page.)

4 **Supporting plate** is ½" plywood sandwiched between two sheets of ⅛" aluminum. Plywood is cut out to receive harness ends.



5 **Harness** is quick-release type, No. AN-1201-1. When lever is pulled, all buckle parts separate instantly and harness slips off.

8 **Demand valve.** No. AN-6004-1 Diluter-Demand Regulator is type best suited for underwater use, as it has built-in pressure regulator.

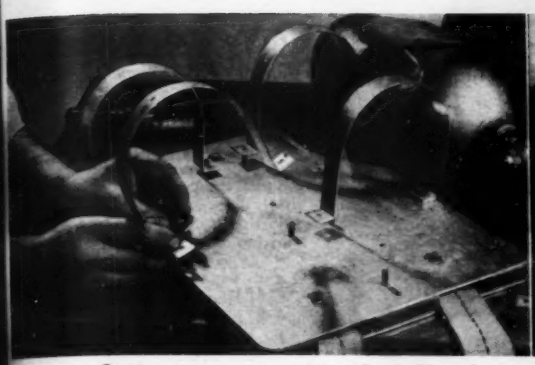
9 **Do not use.** Oxygen regulator type A-13 is also a demand valve, but it is made for low pressure and is not suitable for diving.

10 **Converting** demand regulator. First step is removal of diluter knob and clapper valve located beneath it. Save O ring for later use.

14 **Plug small opening** at side of regulator with ⅛" pipe plug. Use Permatex No. 1 on all threaded connections and plugs.

15 **Replace spring** of diaphragm lever with one of same length and diameter, but heavier, to add snap to diaphragm return action.

16 **Back off screw** on pressure regulator to cut air flow. Adjust this screw after underwater trials if you get insufficient or excess air.



6 **Aluminum straps,** 1" wide, hold tanks in place on supporting plate. Length of tank connector determines spacing of straps.

7 **Brass pipe plug** closes lower opening in connector. This plug can be removed and gauge substituted to check tank pressure.

11 **Install** auto-heater-hose fitting after cutting off diluter-knob pivot with hacksaw. Use O ring to seal flange.

12 **Screw flange back** in original position and force short length of auto-heater hose over heater fitting. Grease all screws.

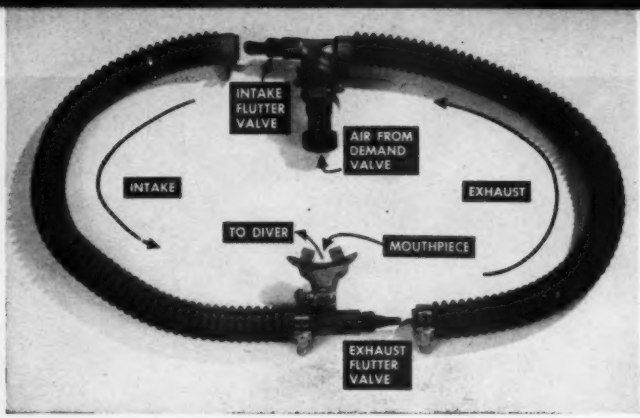
13 **Slip flutter valve** over heater fitting and clamp with screw-type hose clamp. Rubber noisemaker can be used as flutter valve.

17 **Seal edge** of diaphragm with Permagasket to keep water out of regulator. Apply several built-up layers rather than one thick one.

18 **Waterproof diaphragm** with several coats of rubber cement. Dust final coat with talcum to prevent it from sticking to cover.

19 **Mount regulator** on tank connector and brace it with aluminum strip. Use ¼" pipe nipple to join regulator to connector.

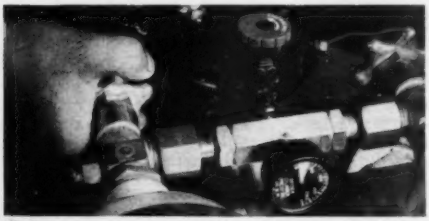
Please turn the page for more diving-lung photos.



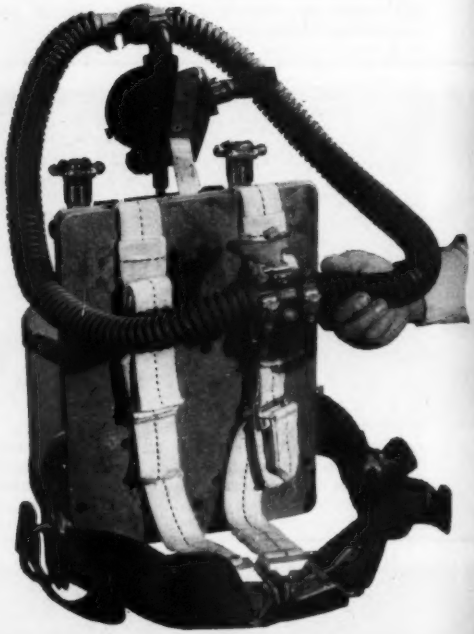
20 **Breathing hose** is valved with two rubber noisemakers to control flow of air. Arrows show path of pure air (intake) and exhaled air (exhaust). Mouthpiece is type used on snorkel tubes. It can be bought separately at sporting-goods or department stores.

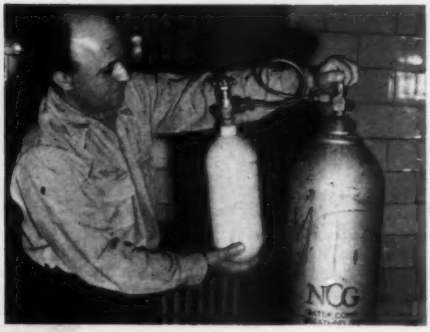
21 **Ready to go.** Hose is positioned so that it falls naturally into mouth area.

22 **Flutter valve** consists of rubber noisemaker forced over a wooden thread spool. Half of spool is wrapped with tape and driven into tee. Rubber is cut short to reduce noise.



23 **Pressure gauge** tells tank pressure before and after each dive; remove it when diving. Emergency valve provides constant air flow if diaphragm sticks or fails to function.





Tips on Air and Tanks

Filling tanks. Only purified compressed air should be used in the diving lung. You can have your tanks filled at fire-fighting equipment dealers; they stock air for firemen's rescue equipment. Your local oxygen-therapy-equipment dealer may have compressed air, or he may get you a large tank from which you can draw several charges (left). For this you'll need a filling attachment that consists of a short length of high-pressure tubing fitted with a compression fitting at each end to match the valves. Renting one large tank probably will save you money in the long run.

Transferring the air should be a gradual process, both to keep the lung tanks from get-

How to Use Your Diving Lung

USING a diving lung is as safe as crossing a street. However, you wouldn't send a child across a street without telling him to cross with the traffic light and to watch out for the cars. *You*, for the first time, are about to cross into a new medium—deep water. Knowing how to act and what to expect will make your trip safe.

▶ Take several deep breaths before diving. They'll clear your lungs and get you a little ahead on your oxygen needs.

▶ Dive with someone, or have someone on the surface ready to give aid if needed.

▶ Take a light rope along on your first few dives. Tied to the boat or pier, it will be a comforting contact with your own world.

▶ Stay by the rope until you get your weight belt adjusted. If you take too many weights down with you, you'll have to throw off the belt to get back up.

▶ Establish a rhythm of breathing and maintain it. If the rhythm is upset you may take water in your mask or mouthpiece.

▶ Swallow any water that enters your mouth. It's easier than trying to blow it out.

▶ Blow through your nose to get rid of water that enters your mask. The water will leave with the air around the edges of the mask.

▶ Swim quietly and without undue exertion. This will conserve air and let you breathe normally. Use fins for easy swimming.

▶ Take your air gradually rather than trying to fill your lungs all at once. You'll find that a long slow breath will bring in all you need; a quick sharp breath may panic you as the air will not seem to come through fast enough. If you get too little or too much air, readjust valve shown in photo 16.

▶ Important. Never hold your breath while coming up. Air taken into your lungs at the bottom will expand as you rise, forcing your lungs out and possibly injuring them.

▶ Dive without ear plugs. They trap air inside your ears which reacts to pressure changes to create discomfort. Water pressure can also force plugs deep into your ears.

▶ You'll feel the pressure of the water on your head and ears as you go down. Pause a moment, press your mask tightly against your face and blow through your nose to relieve the pressure. After a few dives, you'll become accustomed to the pressure around you.

▶ Swim to the surface immediately when you feel your breathing growing difficult. When tank pressure drops to about 300 p.s.i. it becomes slightly more difficult to pull it from the tanks, but easy breathing will get you topside. Beginning with a full charge, the two tanks shown give a useful diving time of about 40-45 minutes.

▶ Limit your dives to a maximum of 30 feet. If for any reason you must release the outfit, you'll have to swim to the surface; and more than 30 feet is a long way up.

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ting hot and to avoid pressure surge. It's a good idea, too, after filling the tanks, to cover the demand valve with a blanket before opening the tank valves to let 1,800 p.s.i. into it for the first time. The demand valve specified is designed for high pressure, but they've been tossed around in the surplus stores for several years so the precaution is a good one.

Buying tanks. Most surplus oxygen or CO_2 tanks are suitable for diving-lung use. The following tips will help you to get your money's worth:

● Look for dents or deep scratches; no reliable fire-fighting equipment station will charge a damaged tank.

● Look for the last test date stamped on the tank. The Interstate Commerce Commission requires that high-pressure tanks be tested hydrostatically every five years. You'll very likely have trouble getting outdated tanks filled.

● Avoid the so-called shatterproof tanks that are bound with brass wire. The wire must be removed when the tanks are tested.

● Look for tanks that are equipped with valves. Some CO_2 tanks are automatically operated and have no valves. This means additional expense for you.

● Be sure your tanks—especially CO_2 tanks—are empty before you take them apart for washing out the inside. If you should puncture the seal on the valveless type, you'll have a very active unguided missile on your hands. Best bet if you're doubtful, or if the tanks feel heavy, is to let a pro unload them. END

This Rig Shoots Pictures Underwater

By Harry Walton

Want a seagoing camera? Put yours in a watertight box.

FUN UNDERWATER

FOR real thrills, take your camera under the waves. In clear, sunlit water you can stop the lunge of a spear fisherman, catch the upturn at the end of a dive, or freeze an underwater swimmer even with a modest f/6.3 lens. Such marine photos can make this summer's vacation one you'll never forget.

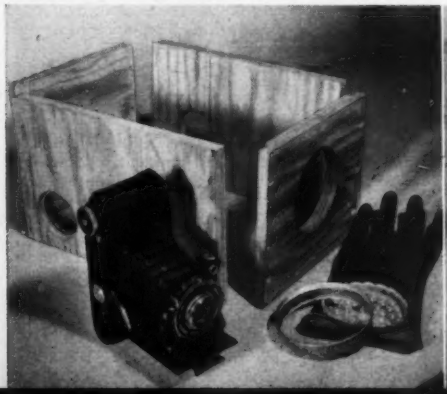
All you need to shoot a few feet under is a watertight box and a rubber glove. The glove, fitted in one side of the box, enables you to snap, wind the film, and even change lens and shutter settings.

You can't go deep, for water pressure builds up with every inch, soon ballooning the glove until it is too stiff to work. But you can have a lot of fun with it, and if later you want to try going deeper, you can pressurize the box.

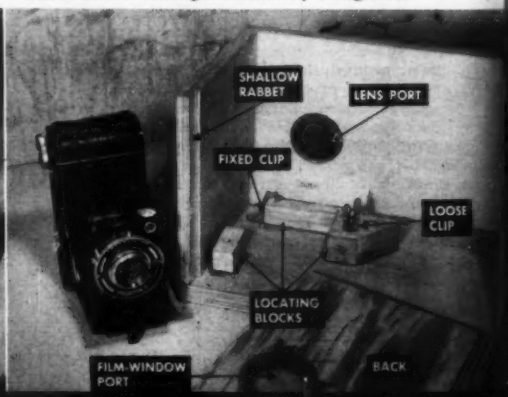
The camera. One using roll film is the most convenient. The winding knob and shutter release should be on the same side. If both are on top, try to mount the camera sideways to bring both within easy reach of the glove. Or, a cable release may move the shutter release to the right.

Flash would be handy, and a socket and reflector mounted outside the box will make

RUBBER GLOVE must be of top quality, while flexible enough to let fingers feel camera controls. Flanged ring that fits snugly into the glove clamps it in. Ring shown was cut from an old percolator filter. Corner joints require marine glue and 1¼" wood screws.



WATERTIGHT BOX has rabbeted endpieces into which front and back fit. Top and bottom overlap these. Blocks glued to bottom position the camera accurately behind lens port. Left side of bedplate hooks under fixed clip; other side is clamped down by wing nut.



it easier to change bulbs than a camera-attached rig. The bulbs will fire in water, although extra voltage may be necessary to compensate for electrical leakage. You can get the necessary wallop from an inexpensive capacitor outfit.

Building the box. The inside depth and height of the box need be little more than the corresponding dimensions of your camera, but to its width must be added space for your gloved hand. You can determine this from a trial setup. With the camera held as it will be in the box, and your gloved fingers on the controls, measure from the camera to the glove cuff.

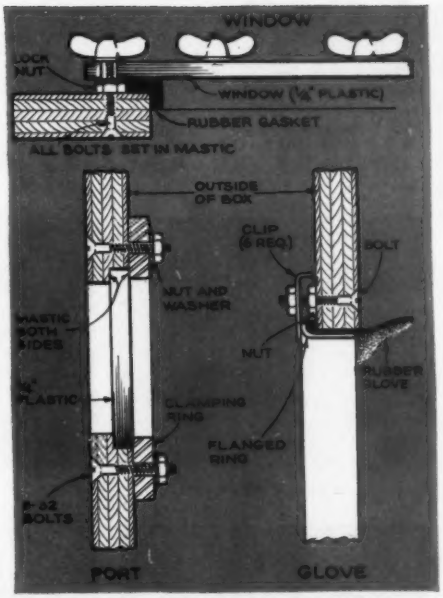
Either marine or exterior-type plywood, ¾″ thick, should be used for the box. Cut the parts to size, but before assembling any, make the holes for ports and the glove mounting. Unless your camera has a winding stop, you'll need a port for the film window as well as one for the lens.

Form steps or rabbets in the port openings by boring with a circle cutter or expansive bit to half depth from the outside face, then resetting the bit ¼″ smaller for boring the final half. Splintering is reduced if you break through from the other face. Make the ports big enough to let light onto the film window, and to avoid masking any part of the lens—2″ at least.

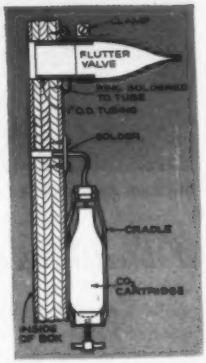
Drill and countersink holes in the ends, the top and the bottom for 1¼″ brass wood screws to secure all the box joints. Then assemble front, ends and bottom temporarily with a few screws, leaving the back off.

Mounting the camera. You will have to devise some means of holding your camera in the required position, leaving it removable through the top opening. Wood

[*Continued on page 186*]

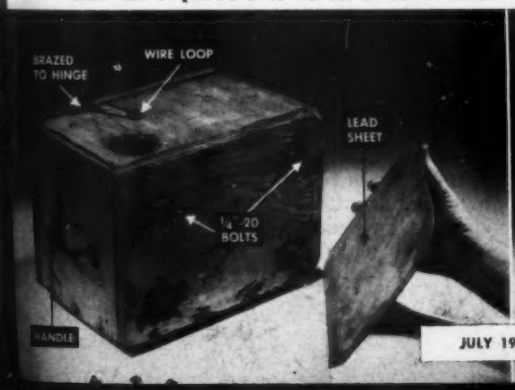


JIGSAWED RING over lens port will protect plastic surface from scratches. Bolts holding glove clips and window are secured by lock nuts tightened directly against box.

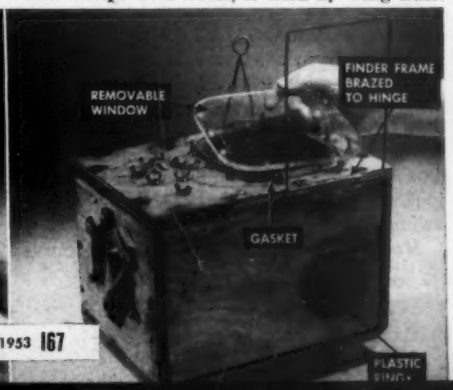


PRESSURIZING enables box to be taken deeper. Carbon dioxide cartridge (right) or midget oxygen tank (air-filled) will supply pressure. Don't omit flutter valve.

BOX IS BUOYANT and unmanageable below surface unless heavily ballasted. Lead sheets (available from plumbing supply dealers) are punched to fit bolts in bottom. Box should be weighted until it just floats awash; this one required over 15 lb. of sheet lead.

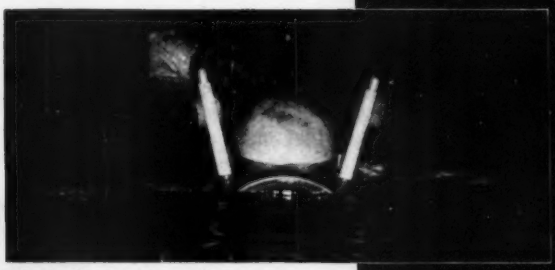


SIX CLIPS pinch bead of glove cuff between flanged ring and box. Rear peep sight and finder frame are bent from brazing rod and silver-soldered to brass hinges. Camera is inserted through plastic window (in hand), which slips over bolts, is held by wing nuts.



What You Can Do with a Snorkel

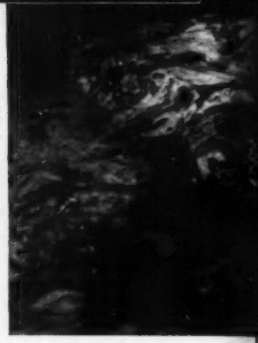
Ball valve keeps out water.



Floats close tubes under water.

Surface cruising is easy.

Surface dives are simple.



A breathing tube will let you swim or float effortlessly.

FUN UNDERWATER

FINDING a dollar bill on the bottom of the Atlantic was as big a surprise as if I'd seen Wilbur Shaw pacing a tricycle race. It was in a tangle of seaweed 10 feet down in the clear water off Key West, Florida. I was snorkeling along, surface-diving occasionally to pick up a shell, when I saw it.

Why. Even when you don't find sunken treasure, snorkeling is a lot of fun. More of these gadgets than ever are being used this summer. The purpose is *not* to make a submarine out of you, churning along with all but the tube tip submerged. Instead, the idea is to let you breathe normally while swimming or floating face down.

How. Most snorkels have a 180° curve at the mouthpiece end. Some of them also have a 180° curve at the above-water end. These usually have a ball valve at the upper end to keep out water. The snorkels without a ball valve can be cleared of water by blowing into the mouthpiece.

For most fun, you should wear a face mask and swim fins. The mask protects your nose and greatly improves your underwater vision. Fins on your feet take practically all effort out of swimming.

Green world. You'll see a brand-new world under water and you'll be surprised how closely you can approach fish. Some of them will almost let you touch them.

I followed a fat, striped little fish for 10 minutes one afternoon. He swam slowly about three feet down. Occasionally he would half turn, look at me and then swim

Combination mask-snorkel (above) has two breathing tubes, covers eyes, nose and mouth.

on. Finally, he became bored with the routine or thought of something better to do. He quickened his pace and lost me in a minute. If following fish isn't your dish, you might want to try spear fishing (PSM, Feb. '52, p. 148).

Should you be tempted to curve yourself a snorkel of plastic tubing, don't make it too long. You can't draw air very far below the surface—your lungs would have a tough job expanding against water pressure. Don't exceed 12 or 13 vertical inches from inlet to mouthpiece. Whatever you use your snorkel for, you'll find your pleasure in swimming greatly increased. You might also find a dollar bill.—*Denis Sneigr.*

Snorkels are sold by many department and sporting-goods stores. Those above were obtained from: 1. Abercrombie & Fitch, NYC; 2. and 4. Aqua-Gun Co., 1121 N. Broadway, Yonkers 3, N.Y.; 3. Bel-Aqua Water Sports Co., 3720 W. 54th St., Los Angeles 43; 5. U.S. Divers Co., 1045 Broxton Ave., W. Los Angeles 24; 6. Bloomingdale Bros., NYC. Prices range from $2 to $12.

Well Cover and Pump Dress Up Garden

SLUICE, above, carries water beyond stonework and holds bucket bail. Two Pennsylvania-Dutch goldfinches add a colorful note to the roof ends. Wren house is small box hinged behind them.

Inner-Tube Valve Makes Sander

A SANDPAPER disk cemented to the bottom of a rubber inner-tube valve is a handy accessory for your electric drill or flexible-shaft outfit.

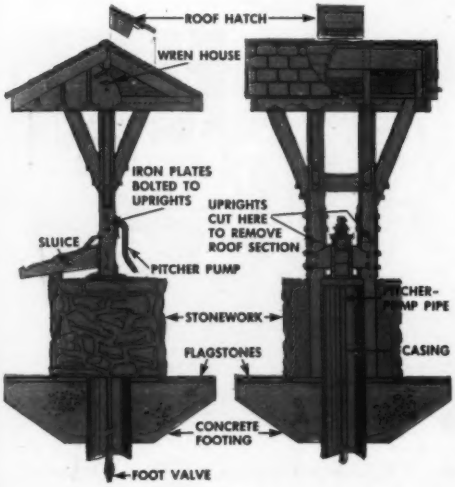
Insert the metal tip in the chuck for sanding inside curves and irregular surfaces. Keep several valves on hand with different grades of sandpaper mounted on them for coarse and fine sanding.—*Norman Hume, San José, Costa Rica.*

Cool, cool water from a well-house pitcher pump beats the best outpourings of a chromium-plated tap.

WE NEVER miss the water when the power lines go down because we've set a hand pump over our drilled-well casing. What's more, the old strong-arm model has been prettied up with a well house that adds a decorative note to the garden.

The design and construction of such a well house is not difficult. But for performance and maintenance there are a few points worth remembering. A simple hand pump can lift water just so far (about 21′, according to the experts). The normal water level in a well casing is usually higher than that, but it's best to check, because if the distance from the water to the pump is greater, you'll need a high-lift hand pump.

This does not mean that the drop line from the pump cannot be longer than 21′. It should be, to insure a cold, clean supply of water, free from surface flotsam. A filter isn't necessary, but a foot valve is a good investment. Without it, the pump will have to be primed each time it is used.



Because I knew in advance that I wanted a well house, I had the drillers burn off the top of the well casing 2′ above the surface of the ground. That gave me a water- and dirt-tight form around which to build a stone base.

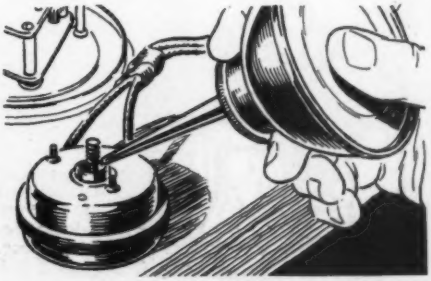
To get at the line to the deep-well pump in my home, I made the top of the well house removable by sawing completely through the two upright members which support the roof section. I waited until these four-by-fours were solidly embedded in the stone-and-cement work, and the whole roof applied, before making the cuts. That insured alignment of the post sections and, because I cut them one at a time and spliced the joints with strap-iron plates and ⅜″ bolts as I went along, there was no need to lower the roof section to the ground, or to prop it in place during the operation. A small hatch in the roof lets me lift the pitcher-pump pipe without removing the bolts and angling the top section to one side.

Our pitcher pump provided poor clearance for a bucket. So I anchored a high-walled sluice to a crossbar below the spout. Extending beyond the stone base, it has two notched extensions that hold the bucket bail.

The birdhouse opening (with a cross slot to make nest-building easy) was cut directly through the facing of the well-house gable. Behind it I put a hinged box, which can be swung open for winter house cleaning.—*Henry B. Comstock.*

Oiling Sealed Clock Motors

SEALED electric-clock motors that have become noisy can often be oiled and silenced this way. Remove the gear-train unit, warm it slightly, and then place a few drops of high-grade light oil in the cup around the gear shaft. Then place the unit in the refrigerator for a few minutes. The contraction of the warmed air inside the gear-train unit draws the oil in during cooling.—*C. L. Bossmeyer, Rockford, Ill.*



KEEPING THE Home SHIPSHAPE

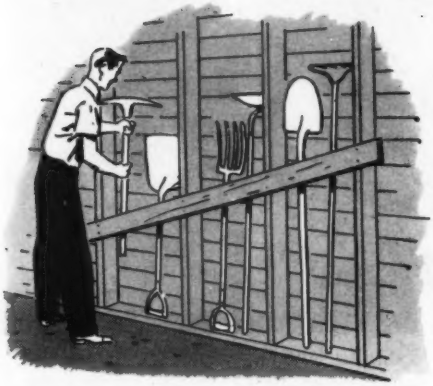
Bench warmers can relax in comfort on patio or porch if the bench is backed up against a wall and a foam-rubber cushion or a quilted pad is hung above it.

A backyard shower like this goes up or comes down easily. Crooked in a photo-lamp clamp, the hose is gripped by a spring-type screen-door latch screwed to the house. With a little forcing, a rubber-necked faucet spray head will fit the hose nozzle.

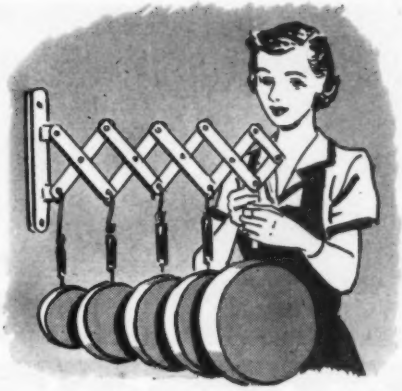
Baby won't tip out if T-shaped legs with tapered arms are set in the straps that support the carriage. Each leg is a bit longer than strap height from ground. Wire hooks keep them from slipping.

Need extra ice? You can freeze cylinders in plastic bottles. Cut the bottles in two to remove the ice intact. Coffee, tea or fruit juices can be frozen handily this way, too.

Modernize that bed with wood slats or metal tubes by painting it, then interweaving with matching or contrasting plastic webbing. Discard the headboard if it is too high.



An easy way to keep garden tools racked in order is to nail a board at an angle across four or more studs in your garage.

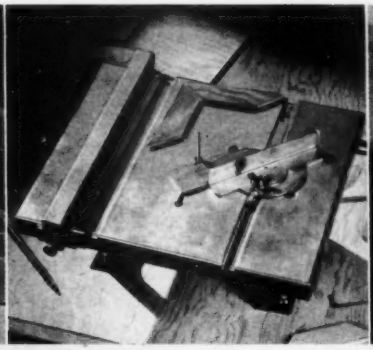


Cooking pots nest against the wall and take up less room in a tiny camp kitchen if hung on the extension arm of an old shaving mirror.

You won't snip the clipper cable by mistake if it stands out against foliage. Wrap the cord a few feet with bright tape or coil plastic no-kink spirals around it.

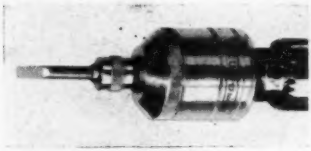
Keep some old socks stowed away in each suitcase and when you pack for a trip, they'll be right at hand to slip over the shoes you pack, keeping them from dirtying your clothes.

Fit it to the pot and a stirring spoon will really scrape bottom to prevent sticking of jams and jellies. Saw diagonally across the bowl of a wooden spoon and sand smooth.

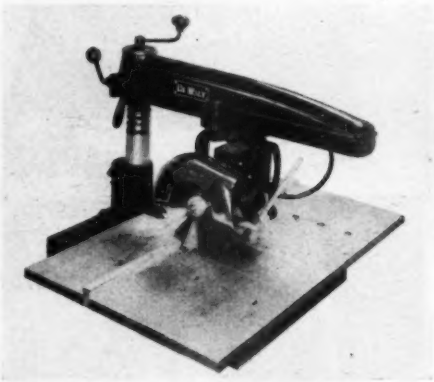


New Tools

1 Portable Jigsaw Cuts Anything. This electric hand jigsaw will cut wood, metal, rubber, leather, plastic, composition board and other materials simply by inserting one of five different blades. As a keyhole saw, it will make internal cuts in wood without a starting hole (left above). Clamped under an accessory table (center), it becomes a stationary saw for accurate cuts with guide fence and miter gauge, or can be used freehand to do many bandsaw jobs. Attachments are available for cutting circles and box joints. The saw also slices through metal easily (right above). It weighs 3 lb., runs on AC or DC and will cut to a depth of 1½" in softwood and 1" in hardwood.

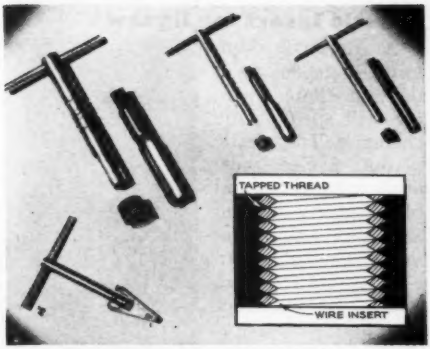


2 Drill Attachment Drives Screws. Any ¼" electric drill will drive screws with this speed reducer. By varying hand pressure on the revolving drum, speed of the screwdriver bit can be regulated from zero to the full speed of the drill. A special connector permits it to take various screw- and nut-driving accessories.

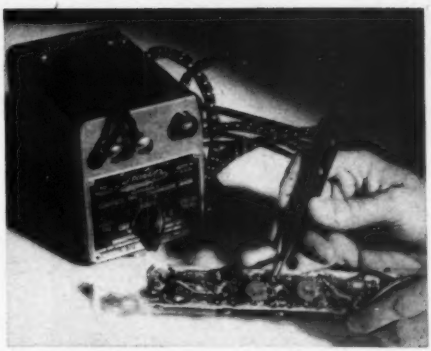


3 Radial Arm Has Longer Reach. You can cut to the middle of a 4'-wide panel with this new radial-arm saw. Designed especially for homeowners working with large sheets of plywood and other materials, it has an arm 3" longer than previous models and a table 4" wider and 3" deeper. Controls are also redesigned for easier handling.

4 Tiny Oilers Reach Tight Spots. Small, hard-to-get-at places can be lubricated easily with this kit of four tiny oilers. It has two fine-needle, squeeze-type dispensers for light oils, a plunger type with a larger needle for heavier oils and greases, and a screw-on needle that fits the threaded nipples on small tubes of grease and glue.



5 Kit Restores Threads. Worn or damaged threads in metal, wood or plastic can be restored with this rethreading kit. Old threads are first tapped out to a slightly larger diameter but at the same pitch. Then a spring-like wire insert, with a diamond-shaped cross section (inset), is screwed into the new threads, bringing them back to the original diameter. The kit includes three taps, three sizes of inserts, a tool for winding in the inserts and an extracting tool. Other sizes of inserts are available.

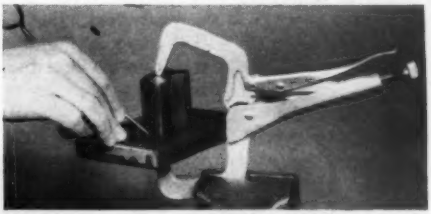


6 Tweezers Solder Small Parts. You can grip tiny parts and solder them at the same time with the tweezer tips on this resistance soldering unit. Heat is generated only when the tips are squeezed together, saving current and eliminating the danger of fire and burns. A foot switch leaves hands free and permits parts to be accurately positioned before current is applied.

7 Envelopes Protect Tools. Tools stored in these envelopes never rust, even in damp cellars. No oil or grease is used. The envelopes have a chemical coating that vaporizes, depositing a protective film on all parts of the tool. They come in several sizes and shapes, including special sleeves for saws, guns and fishing rods.

8 Pouch Keeps Chuck Key Handy. This leather pouch will hold either a pinion key or a hex key taped to the cord of an electric drill. The pinion key is slipped through a hole and the sides snapped around it. A second hole takes a hex key.

9 Emery Cloth Won't Clog. The open mesh in this woven emery cloth permits metal particles to pass right on through and out the other side instead of piling up and clogging the abrasive surface. The cloth comes in six grit sizes from 280 to 600 and will soon be available in coarser grits and in belts, rolls and disks.



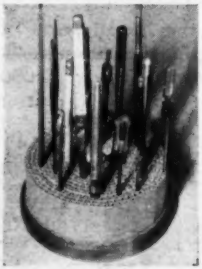
10 Hand Lever Locks C Clamp. You can tighten or release this lever-action C clamp with one hand, leaving the other hand free to position the work. The jaws are first set to the proper opening by the screw in the handle, then the lever is pressed down to lock the jaws closed.

Further information on these products can be obtained from: 1. Black & Decker Mfg. Co., Towson 4, Md.; 2. Drilo Corp., 201 E. Carson St., Pittsburgh; 3. De Walt Inc., Lancaster, Pa.; 4. Baker Enterprises, P.O. Box 457, Canfield, Ohio; 5. Heli-Coil Corp., Danbury, Conn.; 6. Contact, Inc., 238 Main St., Cambridge 42, Mass.; 7. V-Lopes, Westport, Conn.; 8. Par-Kee, P.O. Box 5211, Corpus Christi, Tex.; 9. Bay State Abrasive Products Co., Westboro, Mass.; 10. Petersen Mfg. Co., DeWitt, Nebr.

Old Slats Form New Chair Seat

ONE of the best materials I know of for neat and sturdy seats for outdoor furniture are Venetian-blind slats—the metal kind. They can be cut to size with tin snips and holed with a hammer and nail. Round any sharp corners with a file, interlace them and brad them to the seat frame.—*Joseph Gould, Trenton, N.J.*

Cardboard Holds Small Tools



A COILED-UP strip of corrugated cardboard makes a safe and convenient holder for small sharp-pointed tools like knives, scribers, files and screwdrivers. Glue the coil together and fasten it to a wood base for firmness.

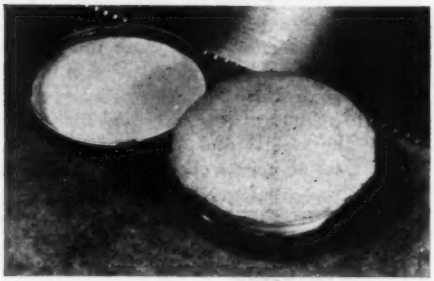
Soap Powder Scraped from Bar

SOAP powder for hair washing or one more load in the washing machine can be made by scraping a bar of soap with a vegetable scraper. Scraping a dry bar will give you powder while a wet bar turns out flakes.—*John J. Rea, Urbana, Ill.*

Plastic Insert for Jigsaw

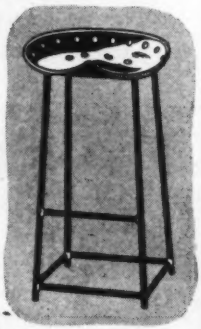
A CLEAR-PLASTIC insert plate cut to fit the jigsaw-table opening will speed blade changing. The plastic permits a clear view of the lower chuck and blade guide, making it unnecessary to remove the plate to change blades. The plastic should be of the same thickness as the metal insert plate. Scratches caused by work can be buffed.

Saw Oiler Is Leakproof



AN EMPTY shoe-polish can and a cellulose sponge cut to fit in it will help keep your saw clean and free from rust. The sponge is pressed into the shallow can, and when oil is added, it swells to hold itself in. At the end of the day, it's easy to remove the cover and wipe the saw with the oil-soaked sponge.—*Will Thomas, Buffalo.*

Stool from Tractor Seat



THE discarded seat from an old tractor or other farm implement and some pieces of metal scrap can be made into a comfortable stool for shop or outdoor use. Weld four ½" metal rods together for the frame and attach crosspieces between the legs. To protect floors, weld small metal disks to the legs and slip on rubber feet.—*J. R. Johnston, Dallas.*

"Every mechanic who invests in good tools feels the same way. The right kind of tools help put more dough in your pay envelope.

Take my advice and stick with Bonney—the *best* wrenches at standard tool prices.

If you're short of cash once in a while—then take a look at BON-E-CON* tools. Like *all* Bonney tools, they're real knuckle-savers. And they carry the regular Bonney guarantee."

BONNEY TOOLS

* *The new Bonney economy line*

Remember. Your local Bonney Jobber, as well as Bonney, stands behind the tools you buy. He has Bonney tools priced to fit your needs as well as your pocketbook.

BONNEY FORGE & TOOL WORKS . . . ALLENTOWN . . . PENNSYLVANIA

Fiery beauty salutes a nation's birthday. Photo was taken on daylight Ektachrome at f/3.5.

Blue fire illuminates this marine fantasy.

Three exposures made this (see next page).

Shoot the Works in Color

The breath-taking glory of July Fourth fireworks is yours for keeps when you catch it on color film.

By Jack Wilson

NOTHING is more beautiful—or briefer—than the burst and flare of a fireworks display. You've probably often wished it would last longer. With color film, you can capture the glory of such lights lastingly, and your projected pictures will draw "Ah's" and "Oh's" from any audience.

Shooting fireworks is fascinating because it takes a quick eye, a fast shutter finger and a dash of luck. You won't know how good you are until the film comes back—but maybe you're wonderful!

To make up for the uncertainty, such shots require no special equipment. You can even get extra mileage from film by making multiple exposures, which better your chances of getting something really exciting on every roll.

A camera with an f/4.5 or faster lens will make good color exposures at the long range from which you usually see fireworks. If you can shoot closer, even a slower lens may give good results, especially if the display is brilliant and the air clear.

Camera must have support. The one must is a solid camera support—a tripod, fence, auto fender or wall. With indoor or daylight color film in the camera, open the diaphragm to f/3.5 or as far as possible and set the shutter on bulb. Attach a cable release if you have one.

Using the first warm-up burst as a target, aim the camera into the sky where the display will occur. With your eye glued to the finder, watch for the firework's ascending trail and open the shutter. When the shower has reached its climax, close it. Do not advance the film. A single burst probably won't fill your finder or make much of a picture.

Remembering where the first burst appeared in the finder, shift the camera slightly so that the next one will appear elsewhere. Judgment, luck and deft control will all have a hand in the result. A pan-and-tilt tripod top will be a help.

If the bursts are well spaced in the finder, you may get three to five on one frame of film. More may overlap and detract from the effect, so advance the film for your next try. In shooting, remember that the human retina sees a split second after the display has vanished. Film doesn't, so open your shutter early rather than late.

Try to shoot where electric signs and auto headlights will not shine into the camera. If moving lights occasionally flash across, shield the lens until they pass. END

Remove knobs or handles and other hardware. You'll find it easier to brush paint smoothly on drawer fronts and cabinet doors. Attach knobs to cardboard as shown above and paint them with a small brush.

Keep bugs out of wet paint applied outdoors by adding insect repellent to each batch that you mix.

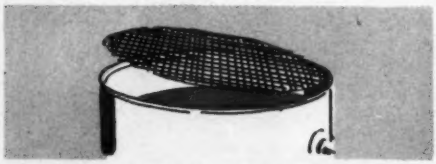
Save painting time by using the widest brush you can for each job. A 4" brush is the most popular width for large, flat surfaces. Use a trim or sash brush, available in 1" to 3" widths, for woodwork, paneling and trim. For narrow table legs and chair rungs, use the narrowest sash brush. A sash brush may be flat or oval.

PAINTING

Copy the dodges used by master painters

Avoid a ring of paint where you put down can by keeping a paper plate under it. Daub a little paint on the bottom of can, press the plate against it and the plate will stick.

Unpainted furniture should first be sealed by brushing a very thin wash coat of shellac on the raw wood. When dry, smooth lightly with sandpaper. Apply undercoat, brush out thoroughly, let dry at least 24 hours and sand again. Apply finish coat with smooth, light brush strokes, using just the tip of the bristles.



Fit a disk of window screening inside can after mixing paint well. As the screen sinks, it will carry lumpy paint particles to bottom.

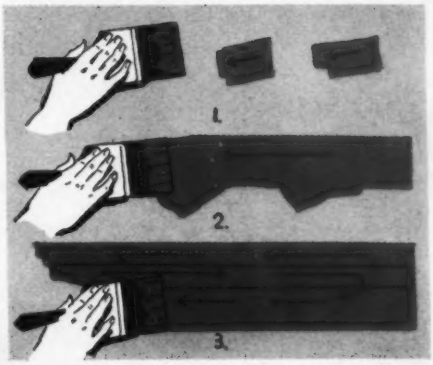
Blend each stroke toward the wet paint area, not away from it, to avoid ridges and lap marks.

Keep bristles pointed downward, or at least tilted at an angle below the horizontal, while you work. Tilt a brush upward only for ceiling work. Pointing the bristles down helps keep paint from running into the heel. If the paint hardens in the heel it will swell the ferrule and perhaps ruin the brush. For the same reason, dip a brush no more than halfway into paint each time you charge it.

Angle your brush into corners; never paint with its sides. Angling in protects the bristles and gives you a smoother, more even finish.

You can lengthen the life of a fine, pure-bristle brush by using it only to apply finish coats. Keep brushes with synthetic or mixed bristles handy for priming and for use on rough surfaces that wear down bristles fast.

Use masking tape where two shades are to meet. Paint on one color, let it dry, apply tape at the dividing line and then brush on the second color. The result will be a neater job and you'll save time.

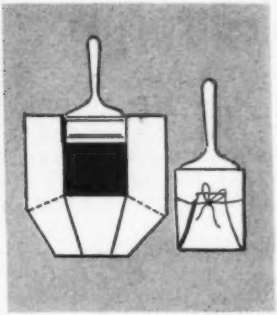


In painting exterior surfaces, you can get a smoother and more uniform job by daubing paint on in spots (1) before stroking. Then use long, leveling brush strokes (2) to spread the paint smoothly. Finish the brush stroke (3) in a zigzag path and you'll have a good-looking job.

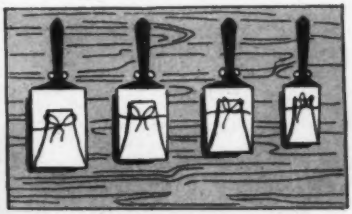
POINTERS

to get best results with the least effort.

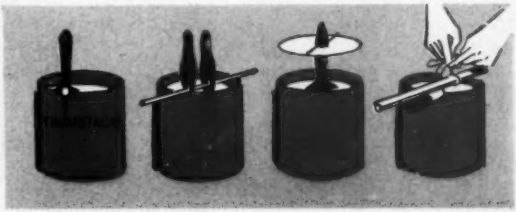
These paintbrush defects all result from misuse of the brush. Painting with side of brush is a major cause of "fingering." If you use a wide brush to paint pipes and similar surfaces it will take a fishtail shape. Swelling may occur if you dip the brush too deeply. If paint hardens in the heel, it will swell the ferrule. Avoid curling by hanging the brush up.



Wrap brush for storage, using heavy paper, oilcloth or aluminum foil. Be sure that the bristles lie straight and that end of brush is not compressed by the wrapping. Suspend the brush with the bristles down. If it's a fine-quality brush used in oil paints, saturate the brush with linseed oil before wrapping it.



Brush storage rack can be made by driving short nails part way into ¾" plywood so brushes can rest on handles. Mount board on door or shop wall. Wrap brushes before storage.



Store brushes in solvent overnight, suspending them in the container by one of methods illustrated here. In method at far right, the handle is tied to thin stick extending beyond bristles. Brush can then stand upright without resting on bristles.

Adapted from How to Do a Good Paint Job, *Baker Brush Co., Inc., 83 Grand St., NYC.*

Match one of these hot little OHV engines with a war-surplus generator —you'll get a welder with juice to spare.

ON-THE-SPOT welding is routine for this powerful little rig. The generator supplies enough juice to weld with ⅜" rod. It will also operate a few 6-volt or a string of 32-volt bulbs for lighting.

Aircraft Generator + Crosley Engine

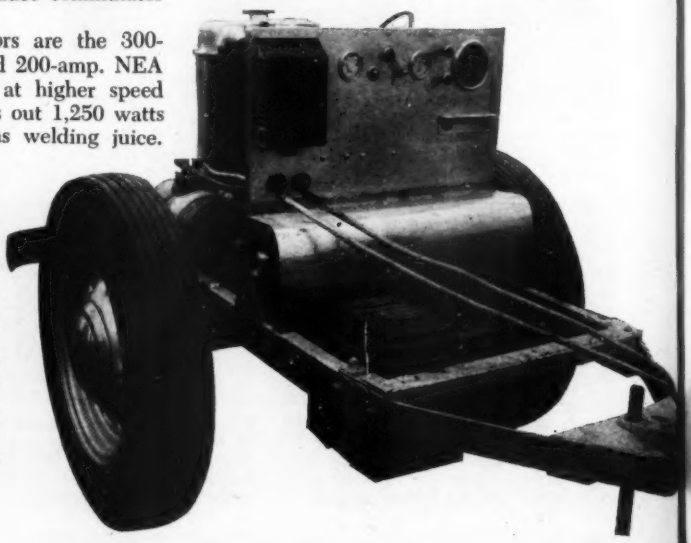
PACKING a 300-amp. punch, this midget welding generator does man-sized jobs. With it I can make repairs right in the field or on the road. Being small, it can be dragged to places where a car couldn't go.

To build one like it, make the war-surplus dealers and auto-wrecking yards your hunting grounds. The generator I finally picked is an R1 Westinghouse aircraft unit rated at 28.5 volts, 300 amp. and fitted with high-altitude brushes. These reduce commutator arcing under heavy loads.

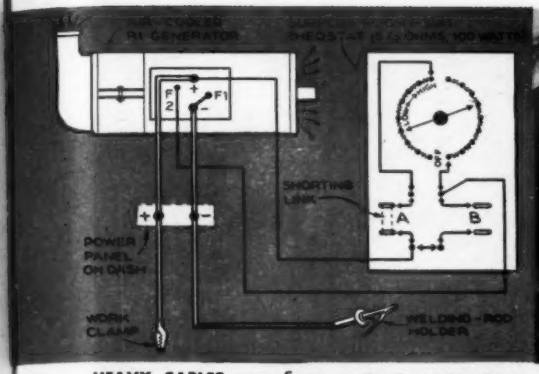
Other suitable generators are the 300-amp. R2, 200-amp. P1 and 200-amp. NEA 5. The latter must run at higher speed (5,000 r.p.m.) but it puts out 1,250 watts of 115-volt AC as well as welding juice.

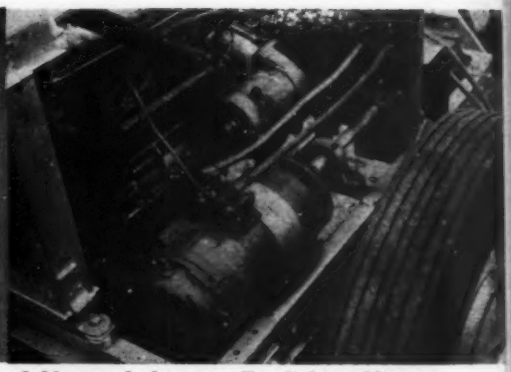
My rig is powered by a Crosley brazed-block auto engine. However, any 10- to 12-hp. job capable of maintaining 2,000 to 2,500 r.p.m., such as an Austin, would serve.

After removing everything back of the flywheel, I shouldered down a 1"-diameter stub shaft to fit the pilot hole in the crankshaft and welded a driving plate on it for bolting to the flywheel. The shaft runs through a self-aligning ball bearing on one



COMPACT AND ROADWORTHY, the trailer can be rolled about and hitched up by one man. Car battery mounted in the frame supplies starting and ignition juice for the Crosley engine. Surplus tachometer (upper right of dash) gives r.p.m. and engine hours. Hole was drilled at rear end of engine camshaft, a drive pin inserted, and a tachometer-cable connecting flange mounted on the valve cover.





HEAVY CABLES run from output posts atop generator to the welding terminals. Field terminal F1 is grounded to negative post; F2 gets current from positive post through the field-control rheostat. For light welding, a 4- or 5-ohm auxiliary resistance is plugged into A in place of the shorting link. Four 6-volt, 32-cp. bulbs can be lit from socket B.

= 300-Amp. Portable Welder

frame member and has a two-groove belt sheave keyed on its end.

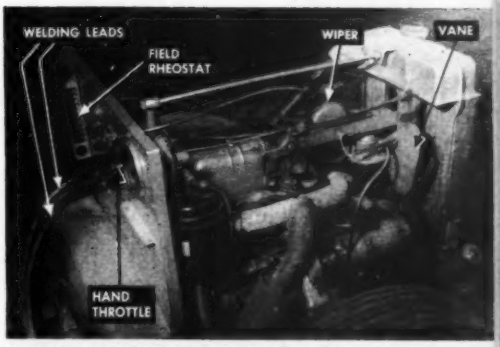
Two similar bearings support the generator-shaft extension. The drive is by twin ⅝" B-type industrial V belts running on two-groove sheaves. These are sized to give a speed reduction of .8 to 1.

A surplus rheostat made for electrically heated flying suits controls the field current, regulating generator output. This unit has two plug-in sockets, one of which must be shorted to complete the circuit.

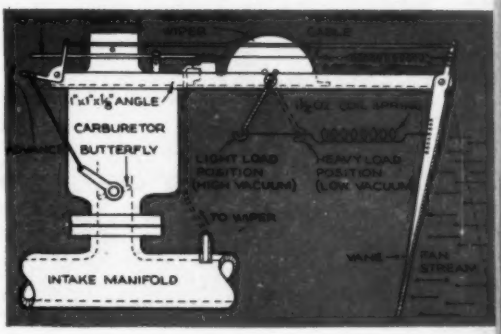
The homemade governor shown gives quick response to varying loads. Pulling out the hand throttle applies spring tension against the vane, holding it against the fan stream and opening the butterfly. Fan action tends to close the throttle.

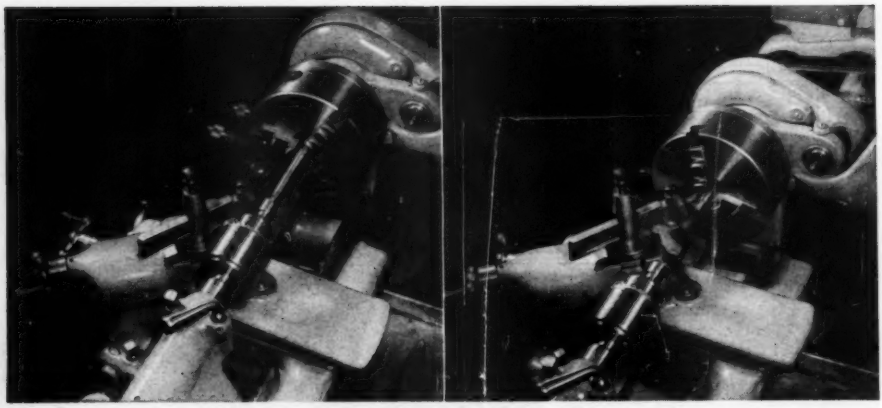
On light load, the vane is helped by engine vacuum working on one side of an old windshield wiper. Under full or sudden increase of load, vacuum drops and the vane spring immediately opens the throttle farther, until vacuum builds up again to balance the vane at the new load setting.

Parts of a light auto chassis were welded to make the trailer frame. It was fitted with a Plymouth rear axle that had been cut apart and rewelded into a smaller unit. A sleeve between the two wheel axles aligns them while leaving them free to turn independently on curves.—*Harold George Schneider, Homestead, Fla.*



HOMEMADE GOVERNOR controls engine under varying arc load. Throttling action of vane behind fan is balanced against manifold vacuum by a salvaged windshield wiper. Wiper valve is shut so that vacuum pulls one way.



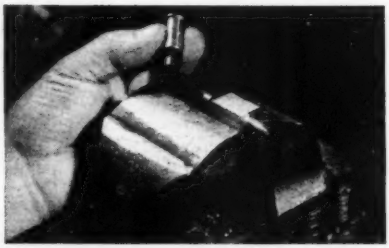


NEW Shop Ideas

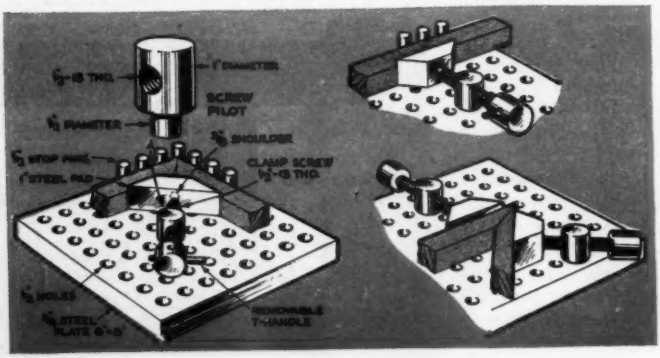
Follower Rest Fits Tailstock. Here is one way to support a slender rod while it is being turned. A bushing drilled to receive the finished diameter of the work is held in the tailstock chuck. The end of the rod is first turned to the finished diameter (left above). Then a cut to the desired length is made, and the tailstock bushing is slid up over the end of the rod. A rough cut is made to bring the rod near the finished diameter and the final cut is taken while advancing the tailstock spindle to keep the bushing close to the cutter bit (right above). Slender turnings several inches long can be made in this way.—*Joseph Tracy, NYC.*

Holder Grips Threaded Work. When working on threaded rod or machining the heads of screws, it is difficult to clamp or chuck them without marring the threads. The two holders shown will grip such work safely.

The one held in the hand is for use in the lathe, while the other one is for use in the vise. The work is threaded part way into the tapped hole and locked by tightening the setscrew against it. Loosening the setscrew frees the work.

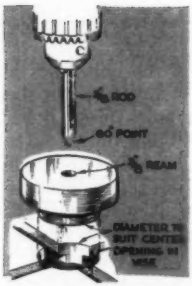


Clamping Fixture Adjusts. You can set up work in a jiffy for welding or brazing with this useful clamping fixture.



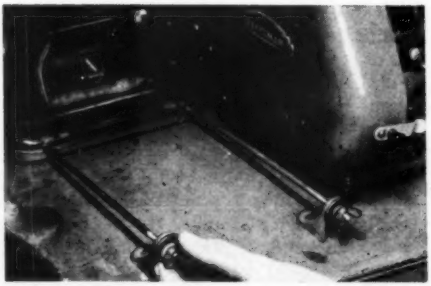
The ½" stop pins and clamp-screw pilots can be placed anywhere on the plate to hold work together at any angle.

The clamp screws shown (left) were turned from ¾" rod and drilled for ¼" drill-rod T-handles. Long ½" bolts with the threads cut all the way up to their heads can be used to simplify the construction. They can be tightened with a wrench, eliminating the T-handle. —*Charles Willey, Penacook, N. H.*



Bushing Centers Rotary Vise. Locating the axis of a rotary vise in line with the drill-press spindle can be a ticklish job. This setup makes it quick and easy.

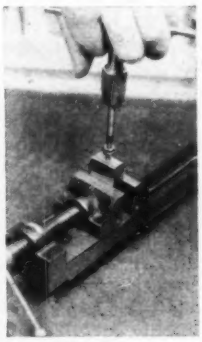
Turn a flanged bushing to fit snugly in the center opening of the vise table and drill a ⅜" hole through its center. Bolt the vise to the table with the bushing in place and adjust the cross-feeds until the ⅜" rod enters the hole. This centers the axis of the table, and work to be clamped to it is centered under the point of the rod. Adjusting the cross-feed will then set the work at any radius from the center for circular or in-line drilling.—*W. W. Lacey, Springfield, Gardens, N. Y.*



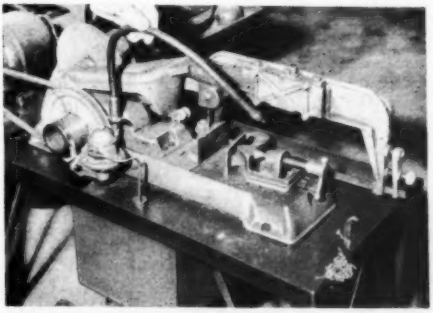
Threaded Rods Adjust Belt Tension. You can use one motor for several bench-mounted power tools by attaching a pair of long threaded rods to its base as shown. The rods are set to the proper length by wing nuts that bear against a pair of cabinet-maker's corner brackets mounted beside the machine. Removing the wing nuts will permit you to slide the rods out of the brackets and transfer the motor to another tool.

Improving Cutoff Tool. A slight radius ground along the top edge of the cutoff tool will help reduce chatter and improve the finish of the cut.

The radius breaks up the chip and makes easier cutting than the flat edge presented by the ordinary cutoff tool ground in the conventional manner.—*Hugh A. Wells, Winston-Salem, N. C.*



Nuts Limit Tapping Depth. When tapping blind holes, lock two nuts against each other on the tap as shown to stop the tapping operation at the desired depth. A tap that bottoms in the work is often extremely difficult to remove and it is frequently broken.—*Will Thomas, Buffalo, N. Y.*



Auto Fuel Pump Feeds Coolant. A controlled flow of coolant or cutting oil can be maintained over work being machined by means of an auto fuel pump. An eccentric mounted on the V-belt pulley strokes the pump arm. Oil is drawn from a reservoir under the bench and directed to the work through a flexible hose. The amount of flow is controlled by a valve mounted on the discharge side of the pump.

This Rig Shoots Pictures Underwater

[Continued from page 167]

blocks, angle brackets, clips and wing nuts may all be useful. Use brass hardware.

Fitting the ports. Sheet Plexiglas or Lucite ¼" thick is recommended. It is shatterproof, and both easier to cut and more transparent than glass. Jigsaw the ports to an easy push fit in their rabbets. Before inserting them, smear rubber cement, latex putty, or similar mastic liberally into the seat. Bed the plastic on this and apply more around the outside edges.

The finder. Since the one in the camera cannot be used, a frame finder is mounted on the case. Remove the camera back, tape some tracing paper in the film plane, and mount the camera in the box. Attach the box top temporarily.

Make and mount a rear peep sight first. It may be a wire loop as in the photos, or a ½" hole in one leaf of a strap hinge. While wearing your face mask, sight through it at a scene 15' away. Adjust a pair of cardboard "L's" held above the front of the box until you see in the rectangle they frame what is visible on the tissue-paper. A flashlight moved within the viewed area will give you a bright spot to see.

Bend a frame of ⅛" brass wire (brazing rod) to the shape determined by the cardboard pieces. Mount this where you held the cardboard. It can be hinged or made to slide in brass clips if you prefer.

Fitting the glove. An ordinary dish-washing glove or similar cheap type will soon rupture, leaving you with a wet camera. Heavy-duty electrician's gloves are too thick to leave you any sense of touch. Buy a high-grade pair just thin enough to let your fingers know what they are doing.

You will also need a flanged ring to pinch the glove bead against the side of the box and keep it tight against the edge of the mounting hole. The one shown was cut from an old aluminum percolator disk. Cut the hole in the side of the box to be a close push fit for the ring with the glove slipped over it. Smear mastic generously inside before inserting the glove.

Clamp the ring down with six homemade clips held with nuts. Before inserting the bolts for these, smear mastic liberally in the holes. Lock the bolts with extra nuts.

Removable window. Cut out the top opening big enough to put your camera through and cement a soft rubber gasket all around it. Cut the ¼" plastic window about ¾" larger all around. Drill the bolt holes in it and use it as a jig to locate those in the box top. Put mastic in the holes, insert bolts, and draw hex nuts up on them tightly after using a little more mastic around the bolt shanks. Enlarge the holes in the window slightly to make it an easy fit over the bolts.

Assembly. Bolt a husky drawer handle outside the box for your left hand and a second one inside where your gloved hand can seize it. Run the bolts right through the walls, for the box will be heavy when ballasted. Also insert four ¼"-20 brass bolts through the bottom to hold the sheet-lead ballast. Drill all bolt holes a close fit and push mastic into them.

If everything checks, you are ready to take the box apart and reassemble it with phenolic-resin glue in all joints. Apply three coats of enamel or varnish inside and out, and you're ready for a water test.

With the window snugged down evenly, weight the empty box down in a tub and cover it with water. Bubbles will pinpoint any air leaks, which may come from joints or from edge-grain pores in the plywood. A little mastic should seal them readily.

Get set for pictures. Having fastened the loaded camera inside the box, pull the glove inside out before bolting down the window. This traps extra air that helps counteract water pressure.

If the box has been well ballasted with lead on the bottom, it should prove easy to handle in the water. Shoot only in clear water—even flash won't penetrate murk.

Pressurizing the rig. As shown, the outfit kept a camera bone-dry in shallow water. If you want to shoot in deep water, water pressure must be balanced by pumping air or carbon dioxide into the box. You can't do this before taking the rig under water, as the glove would pop out. It can be done by mounting a small CO_2 cylinder —the kind used to charge soda water—outside in the bracket furnished with CO_2 model-airplane engines. By turning a screw on this, pressure can be released a little at a time.

With pressure inside, all ports must be held by a clamping ring, and a safety valve is a must. This can be the single flutter type used on some snorkel outfits. As the camera is taken deeper, water pressure will swell the glove, tipping you off to let more gas in. Excess pressure will bubble out. END

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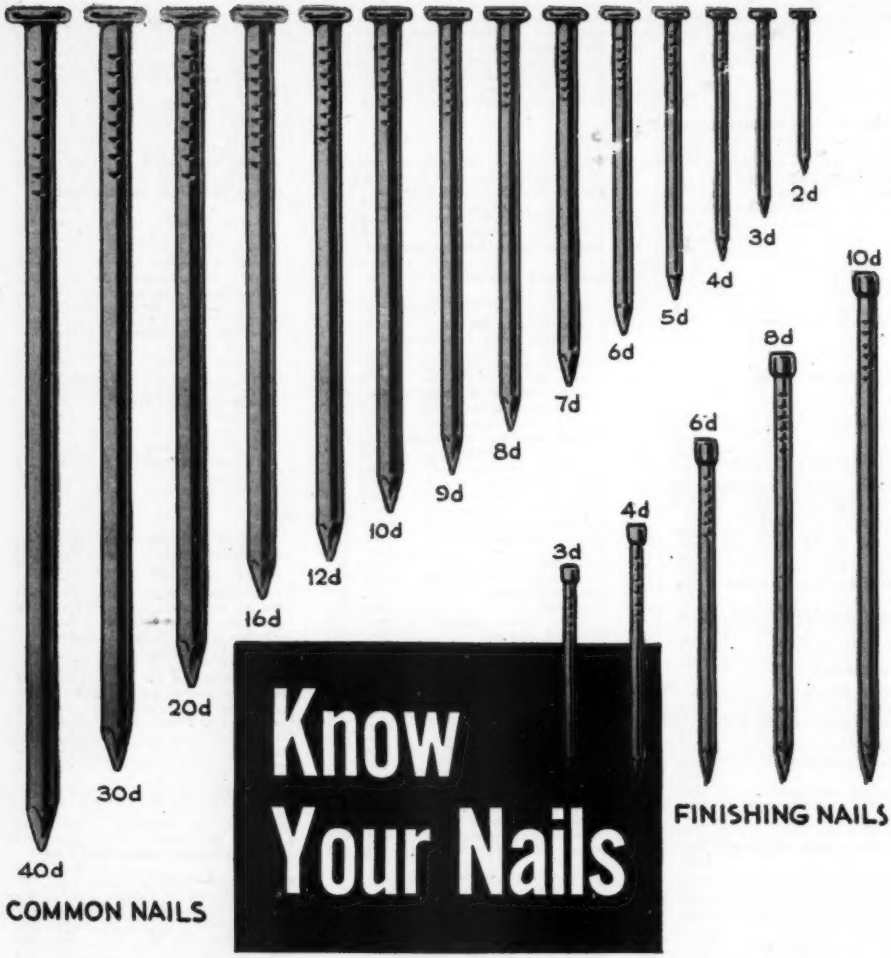

COMMON NAILS			
Size	Length	No. Gauge	Quantity Per Pound
2d	1"	15	850
3d	1¼"	14	545
4d	1½"	12½	295
5d	1¾"	12½	250
6d	2"	11½	170
7d	2¼"	11½	150
8d	2½"	10¼	100
9d	2¾"	10¼	85
10d	3"	9	65
12d	3¼"	9	60
16d	3½"	8	45
20d	4"	6	30
30d	4½"	5	20
40d	5"	4	16

GOT a box full of assorted nails? Wish you could tell one from the other? Just hold 'em up against these actual-size drawings to identify them in a jiffy. The charts at the bottom of the page tell all about nails, even to how many you get in a pound ("d" means penny size).

FINISHING NAILS			
Size	Length	No. Gauge	Quantity Per Pound
3d	1¼"	15½	890
4d	1½"	15	635
6d	2"	13	295
8d	2½"	12½	200
10d	3"	11½	125

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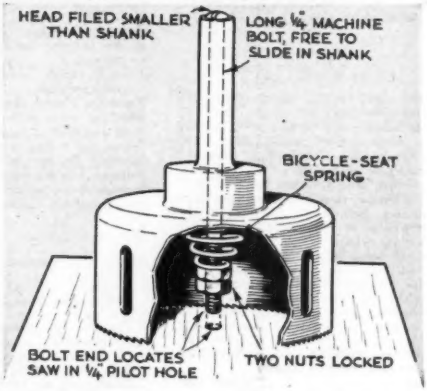
Cooling Cabinet for Iron

To provide a safe place for a hot iron to cool, I built a cabinet near the ironing board. The iron hangs from the rod and is steadied by the sheet-metal angle plate in the bottom of the cabinet. There is an inch of space between the iron and the metal-lined walls.—*Arne O. Salonen, Raymond, Wash.*

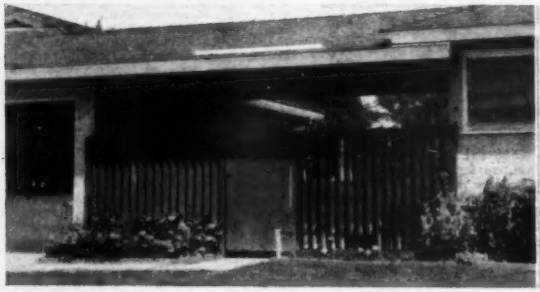
Disk Ejector for Hole Saw

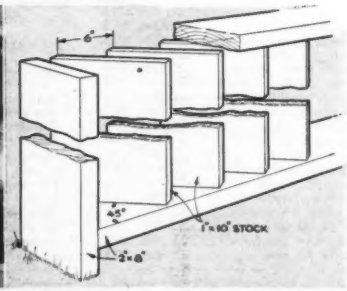


Prying the scrap disks out of a hole saw is a bottleneck to any production effort. This spring ejector, mounted in place of the ¼" pilot drill, will push them out as fast as you can cut them.

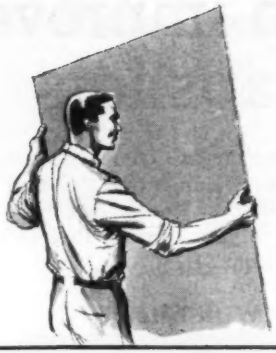
The pilot drill is replaced by a long ¼" machine bolt. Two nuts locked together near the end of the bolt hold a bicycle-seat spring in place in the cutter. Pilot holes, ¼" in diameter, are drilled in the workpiece, and the end of the bolt is guided into them to locate the saw. As the saw cuts into the wood, the surface presses on the lower nut, forcing the bolt upward against the spring. The shank of the hole saw must not be inserted all the way into the drill chuck as space must be left for the bolt head to rise. When the hole is cut through and the saw is raised, pressure exerted by the spring ejects the disk.—*Ralph K. Golden, Elkhart, Ind.*

Louvered Fence Affords Privacy But Lets in Breezes

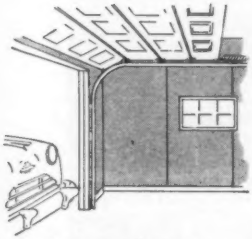




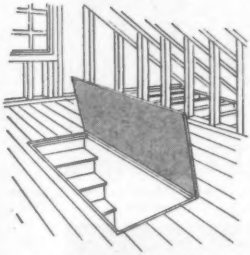
You can have privacy in your yard and still not stop cool breezes. A louvered fence is the answer. The louvers that take the place of pickets are set at 45° to the rails, letting a passerby see in only at limited angles. Redwood was used for this fence but most anything available will do.—*Hi Sibley, Nuevo, Calif.*



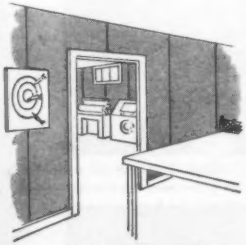
Jobs you can do with Armstrong's TEMLOK BOARD



Finish garage interior



Insulate attic trap door



Build playroom walls

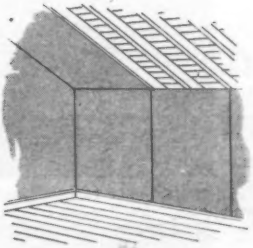
There are dozens of places in your home where you can use Armstrong's Temlok Insulation Board.

Temlok is the low-cost way to finish walls and ceilings of any extra rooms you may be adding in the attic or basement. It's useful, too, if you're converting an open porch to inside living space. If you're building a summer home and want to keep interior finishing costs down, Temlok Board is your answer.

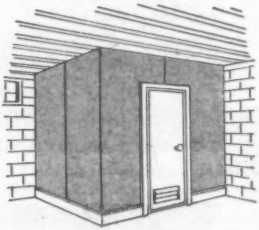
Temlok is a pre-finished fiberboard material. It builds, decorates, and insulates in one operation. Temlok comes in 4′ widths, and lengths up to 12′. Its big size speeds application, minimizes joints.

This material is available in two types. Temlok Insulation Board is ½″ thick, with a two-coat, Light Ivory finish. Temlok Wallboard is lower in cost, comes ⅜″ thick with a textured Ivory finish. Both are easy to work and handle.

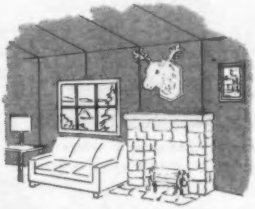
Send for this free booklet, "New Ways to Remodel Your Home." Write Armstrong Cork Company, 3507 Washington Avenue, Lancaster, Pa.



Finish attic walls



Build darkroom



Finish cabin interior

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See how filters can improve your summer snapshots

Nothing could be simpler! Slip an inexpensive Kodak Wratten Filter over your camera lens for new realism and interest in your outdoor black-and-whites.

Preview your results in the filter examples shown below. Get ready now to take your best summer and vacation pictures. Have your Kodak dealer fit the right filters to your camera. Prices? Very reasonable, from $1.75.

Without filter

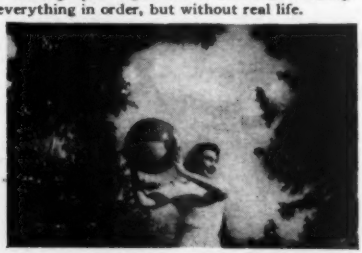
Normal Photograph—This snapshot has good composition but little else. The sky is especially flat.

With filter

Taken with Yellow (K2) Filter—Picture now has life, quality. Skies are darkened, clouds well defined.

Normal Photograph—Again this is a nice album snapshot—everything in order, but without real life.

Taken with Yellow (G) Filter—More powerful. Gives you even more sky emphasis, more drama.

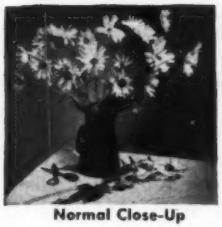


Normal Photograph—Here you need a green filter to emphasize foliage and clouds and improve skin tones.

Taken with Green (X1) Filter—See the difference? It's simple to do the same for your pan film snapshots.

Normal Photograph—A "bare" lens has missed the excitement of this potentially dramatic shot.

Taken with Red (A) Filter—You get the ultimate in dramatic contrast, with pan and infrared films.



Normal Close-Up

With Kodak Portra Lens 1+

With Kodak Portra Lens 2+

With Kodak Portra Lens 3+

For extreme close-ups—Kodak Portra Lenses 1+, 2+, and 3+ for both still and movie cameras. Place one in front of your camera lens to step up its power for short-range photography of people, nature studies, and table-top subjects. Kodak Portra Lenses are graduated in power, as their numbers indicate. To secure even stronger effects, the lenses may be used in combination. The pictures above show how you can "move in" with a Kodak Portra Lens. From $2.65.

See the close-ups you can get with other inexpensive lens attachments

Doubles the scope of your camera—There's a Kodak Close-Up Attachment for most any Kodak or Brownie camera, or fixed-focus movie camera. It lets you shoot at closer than normal range. You get extra-big, sharp images of people, flowers, and small still-life objects. It's a simple, inexpensive way to enjoy a new experience in picture taking. All sizes $1.63.

A Kodak Close-Up Attachment slips easily over most any camera lens, gives you pictures like one at right.

Use Kodak Filters for color films too

"Warm up" your color shots with a Kodak Skylight Filter—With this filter you get warmer-tone color pictures of subjects photographed in open shade and on overcast days. Use it, too, to reduce the bluish cast that often appears in distant mountain and marine scenes. And when you have occasion to take pictures of sunlit snow scenes, you'll find the Skylight Filter highly valuable. Prices from $1.75.

Kodak Daylight Filter (No. 85) for Kodak Type A color films adapts these films for daylight exposures, and permits use of the same exposure settings as with Daylight Type Kodak color films. From $1.75.

Kodak Light Balancing Filter 81C adds warmth to flash pictures taken with Class M Flash lamps (such as No. 5) when using Kodachrome Film, Type A, and reduces the bluishness that sometimes appears. From $1.75.

(left) **Handy shade for lens**—The Kodak Lens Hood is recommended when subjects are side-lighted or back-lighted. It tends to centralize the light and eliminate edge-flare in a picture. Can be fitted to most any camera. From $1.75.

Summertime is snapshot time. Your Kodak dealer has anything and everything you'll need to make this summer's snapshots the kind you'll be proud to show. Always make him your headquarters for your photo needs.

Prices are subject to change without notice

Eastman Kodak Company, Rochester 4, N. Y.

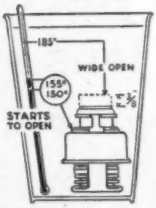
Kodak

Care and Feeding of Engines

BY S. P. CORP

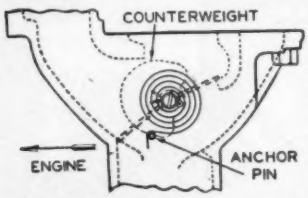
ENGINES REQUIRE HEAT

If you still have a winter thermostat in your engine, perhaps it should be replaced with a summer thermostat. In hot weather your engine should operate at 160°, but winter thermostats don't start to open until they reach 180°. Suspend your thermostat in a pail of water and heat water gradually until thermostat starts to open. At this point thermometer should read 150° to 155°. Valve should be wide open (5/16 inch off seat) at 180°. Winter thermostats open wide at 200°. This is too hot for summer driving. If yours is not wide open at 180°, replace it for hot weather.



MANIFOLD HEAT CONTROL VALVE

A spring thermostat in the exhaust manifold controls the valve that controls heat to the intake manifold. Check the operation by moving the counterweight with your hand, or watching counterweight as engine is accelerated. If it remains closed, intake manifold will be overheated, reducing your speed, causing sluggish operation or erratic speeds with a steady throttle. To correct this, use penetrating oil around the shaft, then work shaft until free.



WATER DISTRIBUTING TUBE

If your car is two years old and has a water distributing tube, remove water pump and inspect tube. If it *is* plugged or rusted away, overheating may be caused.

FREE BOOKLET ON CAR CARE

"More Power, Less Gas, Less Oil," is an illustrated manual on care of your car—free on request. It tells all about Sealed Power KromeX Ring Sets and the MD-50 Steel Oil Ring, best for oil control even in badly tapered and out-of-round bores. It can save you a lot of money. Just address a postal card to Sealed Power Corp., Dept. H-7, Muskegon, Mich.

He Builds America's Finest Wagons

[*Continued from page 89*]

But the finished result was sad to see. "I had been brought up on a wheat ranch in the wide-open spaces of Oregon," Collins recalls, "but I never had seen or heard of a covered wagon like the one which came from that kit. It was not even approximately accurate. All at once I realized what a gap this was in our knowledge of American transportation. There were fine models of trains and cars galore, yet none of wagons—and wagons had served our people for nearly 250 years before the first steam railroads."

Catalogue Gives Real Low-Down

Collins at last found a hardware store which had a dog-eared catalogue of wagons in the basement. He got it for the asking and put together his first model from its specifications.

It was a ranch wagon. Collins' tools were a pocket knife, egg-beater drill, hacksaw, screwdriver and pair of pliers. The task challenged him, and the effort made him forget his anxieties.

A genuine covered wagon was Collins' next project. He had to get a prairie schooner out of his system, to erase the bad taste left over from that disappointing kit. This time Collins had a real-life model—a canvas-covered wagon near a Los Angeles movie set.

Schooner Built with Precision

Collins' persistence for detail began with this wagon. It would be as accurate as the kit had been inaccurate. He read voluminously about horns and lanterns. All were built precisely to scale. The barrels contained water from the Snake River, which thousands of frontier families had forded at great peril.

Of course, the powder horns were full of actual gunpowder. Could Ivan Collins leave his imaginary pioneers to face Indian hostiles, with only perfumed talcum to pour into the pygmy muzzle-loaders on which their legendary lives depended?

[*Continued on page 200*]

IT'S a powerhouse on wheels . . . a beauty to look at, to handle, to own. It's built to rule the highways, with a 55 HP, 74 OHV engine . . . to take the byways in stride, with shock-absorbing action that smooths out the rough spots as no other motorcycle can. It's the Harley-Davidson Hydra-Glide, *the only motorcycle in its class!* Go see this great performer at your dealer's today. Bring along a buddy. For literature and a copy of the ENTHUSIAST Magazine, filled with exciting action pictures and stories, send 10 cents to HARLEY-DAVIDSON MOTOR COMPANY, Department PS, Milwaukee 1, Wisconsin.

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MILLERS FALLS COMPANY

Greenfield, Mass.

MILLERS FALLS TOOLS SINCE 1868

The Mark of Superiority

He Builds America's Finest Wagons

[*Continued from page 198*]

The model wagons were incredibly expensive for a working man to produce. Collins ran through his savings, buying materials. Journeys to far-off wagon Valhallas took all of his vacation time. He sought out former employees of the Brewster Company, which had occupied the Cadillac and Lincoln realm of an earlier day, when it manufactured pompous Victorias and ceremonial hearses.

Sets Up a Wheelwright Shop

He fitted a tiny wheelwright's shop with a tire bender for shaping the steel rims and with a tenoning bench for mortising in the delicate spokes. Like a brawny village smithy, Collins heated the metal rims and then shrunk them on the wheels as the steel cooled.

Collins made only one minor concession to necessity. The wheels that carried early Americans over field and stream were fashioned of sturdy hardwood, principally oak and hickory and ash. But these solid fibers proved too coarse-grained for miniature work.

At length Collins surrendered and turned to mountain maple, which was softer and more pliable. Equally important, it was close-grained and comparatively easy to shape.

In tracking down details about the horse-pulled vehicles in America's past, the wagon-building project of Ivan L. Collins has had something of the element of the chase.

London Cabby Helps Him

In California Collins heard about George Stone, a former London cabby who made his stake in retail business and then sent to Piccadilly Circus for his old hansom as a sentimental gesture. Collins latched onto Stone like a Canadian Mountie seizing his quarry.

The hansom cab in Collins' collection was constructed while using Stone's one-time perambulating place of employment as a model. It is the sole vehicle among the 46 which never was widely

[*Continued on page 202*]

Kelvinator's "Dampness Doctor" MAKES DAMP BASEMENTS DRY AND HEALTHY!

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LINSEED OIL

PROTECTS MOST EVERYTHING

He Builds America's Finest Wagons

[*Continued from page 200*]

adapted in the United States. However, Collins justifies its inclusion by pointing out that many wagons for use in America were made by the firm of Laurie & Marner, producer of the hansom.

Upon finding and measuring a vehicle which had seen better days, Collins would draft a detailed set of blueprints to guide him in building the miniature. Frequently he had to wash off straw, mud and clods of dried manure before he even could identify the wagon he was surveying. This deterioration of his models stoked Collins with extra zeal.

Feared Originals Would Rot

"I knew," he remarks, "that if I didn't construct the miniatures pretty soon, it would be virtually impossible to do so. The originals would collapse into heaps of rotting lumber."

Of course, a few originals already were gone when Collins made up his mind that some craftsman had better devote his attention to wagons before it was too late. He created the hydrogen wagon for Union Army balloons from sketches in the National Museum in Washington, D. C.

With pardonable pride Collins observes, "Several Civil War historians told me that the balloon wagon was exactly like the descriptions contained in War Department journals."

Models Are Heavily Insured

Ivan Collins values each of his wagons at approximately $2,000. The collection is insured for $100,000 and all records for attendance were broken when it went on display at the Los Angeles Museum recently. Ransom Mathews, the museum's director of mechanical arts, said of the miniature wagons: "They represent the finest craftsmanship I have seen, either here or in Europe."

Collins has been urged to publish blueprints, in order that other modelmakers around the nation can vary their locomotives and motor cars with buckboards and Concord coaches. He is con-

[*Continued on page 204*]

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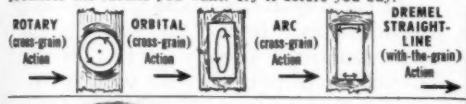
A handy, 16-page "How-to-do-it" booklet containing helpful hints on sanding and refinishing procedures packed FREE with each Dremel Sander. Extra copies, 25c.

MAKE THIS COMPARISON TEST

Sand a piece of wood by hand, using the four distinct sander motions shown below. Note how small scratches and swirl marks appear whenever the **slightest** cross-grain motion is used. Now compare these results with the beautiful, satin-smooth, absolutely **scratch-free surface** produced **only** by straight-line, **with-the-grain** sanding. You'll see why we guarantee professional-quality, scratch-free finishes. You'll be convinced that Dremel Straight-Line Action produces the results you want. Try it before you buy!

MODEL 2000
Heavy-duty model: 21 sq. in. (3⅛"x7") sanding base. Price includes sturdy steel storage case, 25 asst'd. abrasives, 1 polishing pad.
$24.50

MODEL "A"
Hobby and household model sander, polisher, massager (above, right); 12 sq. in. (2¾"x5¾") sanding base. Price includes 6 abrasives; 1 polishing pad, 1 massage pad.
$14.85



SEE YOUR LOCAL DEALER: Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only $2.00 now, pay postman balance plus postage and C.O.D. fee.

DREMEL MFG. CO., Dept. 123-G, Racine, Wis.

NEED a Padlock or Cabinet Lock?

Look for the Corbin Lockshop at your hardware store

NOW! It's easy to find just the lock YOU need in the CORBIN Lockshop!

CORBIN PADLOCKS are tops for *security* . . . tops for *economy*.

CORBIN CABINET LOCKS are easy to install on desks, drawers, chests, wardrobes, gun cases, tool chests, etc. Keep your valuables secure . . . keep the kids away from guns, tools and dangerous medicines.

Look for the CORBIN LOCKSHOP or ask your dealer.

CORBIN

CORBIN CABINET LOCK DIVISION
The American Hardware Corporation
New Britain, Connecticut

New cleaner saves brushes and time

NOW you can easily clean and recondition old hard brushes—or quickly clean brushes after using. You simply place the brush in can of Paint-Trap and work it back and forth on the "Stay Clean" Paint Trap. Emulsifying action washes away any paint, varnish or shellac. After each use, old paint settles in paint trap—liquid stays clean and can be used over and over. It's safe for all bristles—even synthetics!

ORDER NOW—if your paint or hardware dealer doesn't have this new brush cleaner yet, send $1.19 (check or money order) for quart size complete with "Stay-Clean" Paint Trap. Money refunded if you're not completely satisfied.

THE KLEAN-STRIP CO.

2378 S. Lauderdale **Memphis 6, Tenn.**

Masonite Week-end Project

Have more fun outdoors this summer! Enjoy picnic lunches, play cards, etc., on this sturdy table with smooth, durable Masonite Tempered Presdwood® on top and seats. And for sun-soaking, the roomy lawn chair is ideal.

These tough, grainless, all-wood hardboard panels take plenty of knockabout punishment. Weather extremes won't bother them. Never sliver, splinter, or crack. Won't snag clothing and they withstand rain and snow. Easy to cut and fit with ordinary hand tools.

Masonite Presdwood can do scores of jobs around the house, quickly and at low cost. Send for complete information and free home craft plans.

See your local building materials dealer for
MASONITE PRESDWOOD PRODUCTS

A type and thickness for every job!

- **Standard Presdwood**—1/8", 3/16", 1/4" and 5/16" thick.
- **Tempered Presdwood**—black or brown. 1/8", 3/16", 1/4" and 5/16" thick.
- **Tempertile®**—1/8"
- **Duolux**—both sides smooth! Tempered. 4 ft. and 5 ft. widths. 1/8", 3/16" and 1/4" thick.
- **Leatherwood**—1/8"
- **Panelwood** — 3/16" and 1/4" thick.

Better Hardboards for Better Home Projects

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"Masonite" signifies that Masonite Corporation is the source of the product

Please send me free plans for:
☐ Picnic table and chairs
☐ Built-in linen closet

Name.....
Address.....
City.....*Zone*.....
County.....*State*.....

He Builds America's Finest Wagons

[*Continued from page 202*]

sidering such a venture, but first he wants to try his skill with the bygone vehicles of countries overseas—with the carriages that carried Napoleon and the battle chariots of Julius Caesar.

Collins has compiled a vast quantity of data about every one of his miniatures. This makes it difficult for him to decide which is his favorite. He pictures himself on the high, swaying driver's seat, reins in hand, whip at the ready. One moment he thinks he would like to be driving Teddy Roosevelt through Yellowstone Park and in the next minute he imagines himself wheeling a silver-fitted brougham down Fifth Avenue.

But, finally, Collins settles for the Conestoga wagon which first was built in the Conestoga Valley of Pennsylvania.

Why He Likes Conestoga

"It's the wagon that made history," explains Collins. "It was the grandfather of all American wagons, in fact of all American transportation on wheels. It brought the settlers beyond the Allegheny Mountains and across the Mississippi. Wouldn't it have been something to drive one of those great billowing wagons, back of fine horses, through a wilderness where white men never had been before?"

The blue eyes of the tall craftsman light up zealously as he concludes, "I want my miniature wagons to make many generations of Americans conscious of their past. I want the people of today to be proud of the men and women who rode in those wagons and built up our country." END

Inside Shot

A HUNTER was showing off his collection of trophies to some friends and explaining how he had acquired them.

"See that elephant?" he asked. "I shot it in my pajamas."

"My goodness," murmured a surprised young lady, "how did it get in there?"—*The Columbian Crew.*

Ford Track Tests save you money

here...

The quality of materials, the dimensions, the workmanship used in fan and generator belts bearing the Genuine Ford Parts label . . . all were track-tested by Ford engineers before these products were approved for manufacture and general distribution. Thus, you are assured that the belts you buy under this label have been designed to require less tension for efficient operation, to give full traction with pulley surfaces, to fit precisely, minimizing twist, distortion and vibration, to resist destructive oil and dirt. These superior advantages have been proved by actual tests.

and here...

Yes, here again, radiator hoses of varying materials were track-tested and minutely examined after miles and miles of operation. The hose selected to carry the Genuine Ford Parts label has a tough Neoprene lining that resists corrosive radiator solutions. This feature tends also to cut down chipping and sloughing off, common sources of radiator clogging and hose breakdown. Molded without seams and reinforced with knit rayon, Genuine Ford hoses have the "give" to withstand vibrations, shocks, extreme temperatures . . . and their resistance to rust, oil, grease and dirt means added life.

and everywhere

Like Ford belts and hoses, all Genuine Ford Parts are carefully checked and rechecked after punishing track tests. This is your assurance that they're made *right* to fit *right* for quick installation and long life . . . saving you money on both replacement *and* repair time.

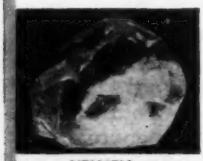
GENUINE Ford PARTS

Insist on these savings

Available at all Ford Dealers and the selected independent garages where you see this sign.

KEEP YOUR FORD ALL FORD

NEW POLARIZED PLASTIC MAKES CAR WAX OBSOLETE



KELVEX

Kelvex, a hard, transparent plastic is now being used for the first time in car polish by a leading manufacturer. It is extremely resistant to the common car wash detergents used by most car washers.

Because Kelvex is entirely different from other polish bases, I.C.U. PLASTICOTE will work in sun or shade — it is not affected by heat and will not smear or streak. It cleans, polishes, and leaves a thin film of clear plastic which has a deep natural lustre that requires no buffing to get a brilliant shine — all in one quick easy operation.

NOW for the first time you can realize the pleasure of a lasting polish that comes ALL IN ONE CAN — AT A REASONABLE PRICE — *and will do a car in less than an hour!*

— AN EXCLUSIVE FORMULA — NO OTHER POLISH CONTAINS THE POLARIZED PLASTIC "KELVEX!"

Next time, save time, get I.C.U. PLASTICOTE in the red-and-white can at your service station or auto supply store. $1.25 full 16 oz. — enough for three cars.

SOLD IN SOME WESTERN STATES UNDER THE TRADE MARK OF I.C.U. AUTO POLISH.

THE LIVINGSTON COMPANY — I.C.U. PRODUCTS
151 Amity Road, New Haven 15, Conn.

PLEASE RUSH ☐ PINTS I.C.U. PLASTICOTE POSTPAID AT $1.25 PER PINT, I AM ENCLOSING $.....

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Manufactured and distributed in Canada by Ewart-Harris Company, Verdun, P. Q.

Doctor Tackles "Unclimbable Peak"

[*Continued from page 73*]

obstacles that caused Eric Shipton, today's great British Everester, to say that K-2 demands better mountaineering "than at present exists." Some of them are shown on pages 72 and 73 in photos by Dr. Houston; Mrs. Elizabeth S. Cowles, a member of his party on a previous expedition to Everest; and Georgia Engelhard of Monkmeyer photo agency.

Avalanche Roars Down on Camp

Base camp would be pitched on a glacier. Over base camp would loom K-2 itself, that 12,000-foot-high pyramid of rotten rock, a four-sided pyramid with sides sloping 55 to 90 degrees.

The rock was so bad in '38 that the weight of climbers upon it started an avalanche. "The rocks," said the men caught under them, "came bouncing into Camp III with terrifying accuracy . . . Escape to either side was impossible, and the route below, like a funnel, caught all the stone fire."

High on the mountain there may be unfamiliar voices. There have been on earlier trips. Voices the explorer can't identify. But the natives do. They say the voices are the Abominable Snowman (PSM, Dec. '52, p. 133).

Human Flies Leap Gaps

There are wide gaps in the rock of the mountain—gaps you may have to leap and stick like a fly on a vertical wall opposite. The slopes get more hazardous as the peak is approached. Five hundred feet becomes the distance between camps—the longest distance a man can climb and come down in a day, before he collapses from fatigue.

There can be tragedy. In 1939, near the peak, an American, Dudley Francis Wolfe of Boston, and three Sherpa porters were lost. A three-day mountaintop blizzard blotted out their fate and blocked heroic rescue attempts.

". . . *And waiting for you,*" wrote Kipling.

Unclimbed K-2 has waited a long time

[*Continued on page 208*]

...REAL ROLLING ECONOMY

You can't beat a CON-SOL for economical rolling. Hundreds of owners of previous models — home owners, managers of parks, golf courses and tennis clubs — all like its low first cost, its even lower upkeep and the way it handles.

Even greater value is built into the 1953 model, which includes no less than 10 important new features — all designed to increase strength, prolong roller life, improve performance, and increase ease of handling.

Weight adjustable from 300-1200 lbs. to suit soil conditions. The heavier All-Purpose Model with sprinkler tank which drips water on the rollers to prevent sticking when used on asphalt — very popular with contractors in laying driveways and sidewalks — is adjustable to over 1400 lbs.

Write for literature, Dept. PS. 7

Prices start at $350.

CON-SOL

CONSOLIDATED INDUSTRIES, INC.
West Cheshire, Conn., U. S. A.

22.5 POWER MICROSCOPE

$1.00 THAT'S ALL

This instrument magnifies objects 20-30 times. See thousands of **Nature's hidden secrets—study insects, foods, minerals, etc.** Educational-Fascinating for youngsters 6-60. No end to its uses. Complete kit includes—sturdy base, tilting stand, adjustable reflector, powerful lens with focusing adjustment, glass slide and directions. Order several at this unbelievable low price of $1.00 each (6 for $5.00). Simply send $1.00 check or money order for each. Sorry no COD's at this low price.

IMPERIAL SALES CO.
480 Lexington Ave., Dept. K-142, New York 17, N. Y.

SHEET METAL BRAKES

Angles, flanges, Pittsburgh locks. 24 G. steel, heavier aluminum. Cam locking, mount on bench, truck or floor stand. Truss braced steel. Express collect. 30", 65 lbs. $26.50. 36", 75 lbs. $33.00. 48", 100 lbs. $48.00. Portable stands, 32" ht, 30 lbs. $7.00

8 ft. BRAKE, similar, 26 gauge steel, **$115.00**
IRON BENDER forms hooks, angles, eyelets, etc. Capacity 1/4x2", 5/16x1 1/2", 10 parts, all steel. Express Collect **$9.50**
30" CURVE FORMER. Forms cylinders, ovals, round corners, etc. Capacity 20 gauge. Express Collect **$9.50**

(Immediate delivery. Order direct, cash or C.O.D., or send for folder.)

VYKE BRAKE CO., S-3016 Leavenworth, Omaha 5, Nebr.

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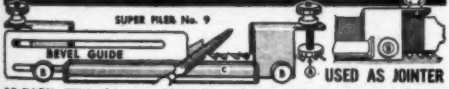

SO EASY: With this new filing jig and jointer anyone can now sharpen any handsaw like new! When file hits hardened steel rollers teeth are finished and EXACTLY SAME HEIGHT. All teeth cut and saw runs true and smooth. Jig and instructions **$2.95** postpaid. Free literature.

SHARPEN YOUR CIRCULAR SAWS

The RIGHT WAY on your own saw table. **Sharpens rip, cutoff, hollow ground and combination blades—6" to 10". Saws stay round with correct bevel. Precision made,** easy to use. GUARANTEED. Only **$8.95.** Includes $3.00 Grinding wheel. **"TRU-CIRCLE"** saw set automatically sets teeth at 10° or more **$2.95.**

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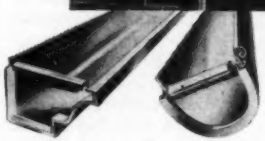
REYNOLDS *Lifetime* ALUMINUM GUTTERS



Rustfree permanence at much lower cost than any other rustproof material.

Amazing low cost for the most beautiful rustproof gutters—about $60. should buy them for an average 6-room house! They go up like a charm—put 'em up yourself. They're lightweight—easy to carry. They won't rust—won't stain walls—never need paint. Non-toxic; won't affect the purity of collected water. No special skill needed to apply. All pieces assemble with slip joints. Half-round and Ogee styles—stippled or smooth finish—downspouts, fittings to match.

Reynolds Aluminum Reflective Insulation

Like magic it reflects up to 95% of radiant heat. Aluminum foil bonded to kraft paper. Just tack or staple up. Rolls—250 sq. ft., 25", 33" and 36" wide.

Aluminum Sheet for Flashing,

Shielding, Shop Work. New all-purpose carton of ten 18" x 48" sheets, .019" thickness.

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MAIL THIS COUPON NOW!
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Send full information about Gutters and Downspouts. ☐ Details and FREE SAMPLES of Reflective Insulation; ☐ Information on Nails; ☐ Flashing.

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Keep Filthy Flies Away from your Lawn, Garden, Patio—

Get—

BIG STINKY

Outdoor FLY TRAPS

Don't suffer inconvenience and discomfort with swarms of vicious flies around your yard this summer. Big Stinky lures, traps, and kills flies before they get to you — or into the house. The Control Fluid plus water on the starting bait attracts a few flies — which are digested to produce a scent which attracts gallons of filthy flies — and Big Stinky is regenerative—it feeds on flies to catch more flies.

Complete BIG STINKY with gal. jar — no parts to supply — and 8 oz. (season's supply) Control Fluid - - - - - - - - - - $4.95

Same with ½ gal. jar - - - - - $4.49

AT LEADING DEALERS EVERYWHERE

mfd. by: DIOPTRON CO., Milwaukee

Doctor Tackles "Unclimbable Peak"

[Continued from page 206]

between expeditions. There have been only four since 1861—against the dozen expeditions that have made Everest famous.

The first attempt on K-2, in 1901, was by an Englishman with Swiss and Austrian help. It was halted over two miles below the 5⅝-mile-high summit. The second, in 1909, by the Italian Duke of Abruzzi, got only 470 feet higher. The Duke, one of the most respected mountaineers of all time, said of the chances of climbing K-2: "No hope."

Second Climb Hit 27,000 Feet

That stopped everyone for 29 years till 1938, when the American Alpine Club made its first attempt. Charles Houston and another American, Paul Petzoldt, that year surprised the mountaineering world by getting to 26,000 feet. This was about as high as France's Maurice Herzog was when he reached the top of Annapurna. But K-2's summit, though it was only two-fifths of a mile above the two men, remained unclimbed.

In 1939, the second American Alpine Club expedition, led by Fritz Wiessner, got past 27,000 feet, to a point only about a city block beneath the peak.

Until this month, no one has tried K-2 since.

Every man whose name is on the roll of the 1953 party—the American Alpine Club's Third Karakoram Expedition—hopes that the third time is the charm.

Until now, Americans have rarely attempted ascents in the Himalayas or the Karakorams. They have not often followed Kipling's instructions to "Go and look behind the ranges." But now they are. Their base camp is itself higher than the highest peak of the U. S. Rockies. END

Outdoor Life

Fisherman: "Say, you've been standing there watching me fish for more than two hours. Why don't you try a bit of fishing yourself?"
Native: "Me? Heck, I ain't got the patience."
—*L & N Magazine.*

HYDRAULIC SPEED REDUCER

WITH FINGERTIP CONTROL

USE FOR: ● Reamer Drives ● Midget Cars ● Feed Mills ● Canning Machines ● Conveyors ● Lathes ● Milling Machines ● Motor Boats ● Cream Separators ● Garden Tractors ● Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7½"x7½"x11½". Gov't acquisition cost $428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

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D.C. ARC WELDER

NEW MODEL 353—DUAL RANGE

For Stationary or Portable Use

HEAVY DUTY RANGE TO 250 AMPS.

New 'Magic Terminal' for Low Current 30 to 100 Amps. Ideal for
● FARM
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Welds Anything From Auto Fenders To Tractor Frames

● Dial Type Rheostat Control ● Use 1/16" to ¼" Rod ● Generator-type Welder ● Reactor Coil for Smooth Even Arc ● Use 7½ H.P. Electric Motor or 10 H.P. Gasoline Engine ● Run at 2500 R.P.M. ● Available with Either Flat Belt or Double V Pulley ● Complete Operating Instructions

Shipping weight 107 lbs. $250.00 Value. Item #65. F.O.B. Chicago **119.50**

CENTRIFUGAL PUMP

General Motors — Allison

200 GALLONS PER MINUTE

Brand New

(ITEM #130)

For Draining Basements
Fire Fighting ● Irrigation
Fuel Transfer
Swimming Pools
Home Water Systems
Dewatering

Converted for high volume commercial, home, and industrial use. Standard 2½" pipe thread inlet, twin 1½" pipe thread outlets. Ball bearing supported ¾" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost $145.00. Complete with full instructions. Ship. wt. 35 lbs. F.O.B. Chicago **39.50**

TYPICAL PERFORMANCE DATA

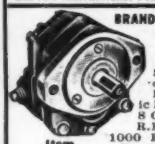
Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

ELECTRIC GENERATOR SET MODEL 251

2500 watts, 115 volts, 60 cycles, single phase, A.C. electric generating plant, powered by dependable 6.5 H.P. Wisconsin engine—Two pole ball bearing belt driven high efficiency generator with heavy duty windings for high torque motor starting loads. Rated 3000 watts for intermittent service. Light weight portable rugged unit, easily transported to job site. Consumes 3 ozs. of gas per hour at rated load. Dimensions: 24"x20"x24", ship. wt. 220 lbs. Complete with fused outlet box and voltmeter. F.O.B. CHICAGO **329.00**

Item #2510

BRAND NEW MULTI PURPOSE HYDRAULIC PUMP OR MOTOR



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Silent, High Efficiency, Helical Gear Type Ball Bearing. Hydraulic Pump or Motor. Rated 8 Gal. Per Min. At 1500 R.P.M. — Delivers — 1000 P.S.I. Using 6 H.P. —Reversible Rotation—¾" Pipe Thread Inlet and Outlet Ports—¼" Drain Port—¾" shaft with keyway and flat for either direct or pulley drive. Dimensions—5⅝" high, 7¼" long, 5⅛" wide. Shipping weight 18 lbs. F.O.B. Chicago **45.50**

Item #1036—Double acting hydraulic cylinder, 3" bore, 36" stroke, ½" pipe thread ports, 1¼" solid steel shaft. Overall length closed 49", clevis mounting at base and shaft. FEATURES ● Cup & Chevron Packing ● All Welded Construction ● Precision Ground and Honed Construction ● Will lift 7000 lbs. using 1000 P.S.I. line pressure. Weight (net) 57½ lbs. F.O.B. Chicago **50.00**

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HEAVY DUTY HYDRAULIC and AIR EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc.

ALL ITEMS BRAND NEW—UNCONDITIONALLY GUARANTEED

Item #126—Four-way, open center control valve with built in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive, easy operation. Can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8½ lbs. An outstanding buy! F.O.B. Chicago..... **21.50**

Item #126

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 P.S.I. line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for... **32.50**

EXTRA HEAVY DUTY DOUBLE ACTION Hydraulic Cylinder

Item #224. 3½" bore, 24" stroke, will lift 8250 lbs. with 1000 P.S.I. line pressure. ½" pipe thread ports—1⅜" stress-proof ground, polished & plated-solid steel shaft. Overall length closed 36". ½" steel wall cylinder barrel clevis mounting at base and shaft. Features—Tie Rod construction. Honed barrel. Ship. wt. 50 lbs. F.O.B. Chicago **39.60**

Item #150—Double acting hydraulic cylinder, 2¾" bore, 12" stroke. Use either foot or clevis mounting. Will lift 4400 lbs. using 1000 P.S.I. Overall length 19½". Shipping weight 8 lbs. Postpaid..... **18.00**

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SAVE $50. OR MORE

● 27 x 28 in. table stays level. Blade tilts full 45 degrees. ● 10 in. blade cuts 3¼ in. deep ● jackscrew depth adjustment. ● Floor model, 34 in. table height. ● New Departure ball bearing arbor, ¾ in. precision shaft, ready to run. ¾ in. bore blades. ● Quick positioning, self-aligning rip fence guide. ● Sturdy wood, steel and aluminum construction. ● No machining—build easily with hand tools only. ● Capacity and performance of floor saws selling for $150.00 and up!

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Same Kit with 10" combination blade..... **24.90**
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GIL-BILT Step-by-Step pictorial plans (No blue-print reading required), full scale patterns—actual photographs for above 10" TILT/ARBOR SAW, 8" TILT/TABLE SAW, 12" BAND SAW, 18" BAND SAW, BELT SANDER, $1.00 each postpaid anywhere in the world or WRITE FOR FREE descriptive catalog.

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Stripes with PAINT instead of INK!

New Master Painters' STRIPING TOOL makes it easy to do expert striping on furniture, bikes, model planes, autos, signs, linoleum, toys, wall board, etc. Makes plain, painted walls look like tile. Paint straight lines, curved, circular or evenly spaced parallel lines the same way a professional painter does. Simply fill Tubular Glass Paint Fountain with any color paint & wheel tip feeds paint evenly. Tips interchangeable — jaws split apart for easy cleaning. Tool complete with tip for 1-16 in. stripe only $1 postpaid. Other complete tools with 1-64, 1-32, 3-64, 5-64, 3-32, 1-8 in. tips, $1.50 ea. Extra tips, 75c. **Complete Kit** with tool and 7 tips, $5.00. Handiest tool in painter's kit. Get it now. C.O.D.'s postage collect.

WENDELL MFG. CO.
4234 N. Lincoln Avenue
Dept. 27, Chicago 18, Illinois

Paints Curved, Circular or Straight Lines

Studebaker with a Cadillac Engine

[Continued from page 80]

hands were always greasy when he came to the supper table.

Even as a field representative for an aircraft company during World War II, Frick kept fiddling with cars. He made a handsome profit on one he reconditioned in his spare time in Australia. And to this day the U. S. Air Force doesn't know that it toted a Frick-reconditioned personal motorcycle from Sydney to New Guinea. Loath to leave a beautiful piece of machinery behind, Frick stenciled *Test Equipment* on the crate.

Too Good at Racing

After the war he accumulated some money in midget and stock-car racing. But he ruined his own business. He won too often—41 out of 65 races. The promoters threw a fit when he showed up. He was spoiling the shows.

It took the other drivers a long time to catch on to what Frick was doing. Knowing that races were won and lost on the turns, he found a way of keeping his speed up in negotiating them. He did it by crossing his suspension—by "loading" the right front and left rear wheels and nullifying a good deal of the tendency of the sprung weight to sway.

Curve Master Does the Trick

He adapts the same idea to his Studillacs today with a patented refinement called Curve Master. It works like a dream. An expensive foreign sports car tried to follow Frick through a curve at 80 miles an hour the other day and had to burn rubber to stay on the road.

Frick started conversions some four years ago. Guys kept coming up to him in his racing days and demanding, "What'll you charge to put a hopped-up engine in my job?" Sensing a new field of profitable endeavor, he accommodated his clients. But they kept coming back with complaints that engines hop-

[Continued on page 212]

PROVED *by Unbiased Road Tests*

CYLINDER WEAR CUT 49% with Miracle Power

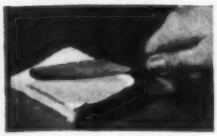
You can't argue with *facts.* Wetmore Hodges & Associates, independent laboratory, road tested two engines—one with Miracle Power, one without.

One of many benefits of Miracle Power proved by this test is its capacity to lubricate upper cylinders. Oil alone won't lubricate here because temperatures may reach up to 1400° and oil burns at 550°. But Miracle Power, a blend of petroleum super lubricants including colloidal synthetic graphite in suspension, withstands far greater heat. That's why the Miracle Power test engine had only half as much bore wear as the engine without Miracle Power.

Other results: After 33,703 miles, the Miracle Power engine was using 33% less oil, had 13% more compression, 56% more plug life, 15% less ring wear.

Use Miracle Power in *your* gas and oil—accept no substitutes.

Stops DRY STARTING Damage . . . Treats the Engine, Not the Oil!



METAL ABSORBS MIRACLE POWER AS BREAD ABSORBS BUTTER—Miracle Power fills microscopic valleys in metal with a breathlike graphoid film. This film holds oil preventing Dry Starting damage (metal to metal contact during the up to five minutes it takes to pump oil to vital parts after starting). It also lubricates when the oil film breaks or burns off.

THE AP PARTS CORPORATION
Miracle Power Division
815 AP Building • Toledo 1, Ohio
Manufacturers of:
MUFFLERS • PIPES • MIRACLE POWER • dgf 123

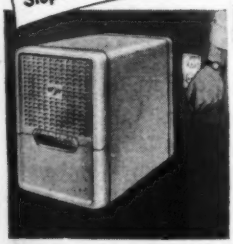
Lubricates *Right* . . . from the Start

Get Miracle Power (money back guarantee) at gas stations, garages and Ford, Kaiser-Frazer, Willys and other car dealers — 75c ($1.00 in Canada)

© The AP Parts Corp., 1953

DAMP BASEMENT?

Stop moisture damage



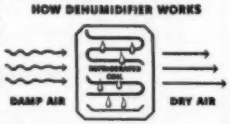
Plug in the amazing

FRIGIDAIRE Electric Dehumidifier

Only 18¼" high — 20½" long—11¾" wide

Plug this amazing device into any convenient outlet, and presto — your moisture worries are over for good! Fan circulates moist air over refrigerated coil. Moisture is condensed and collected in container. May be connected to drain. Dry, filtered air flows into room. Positively controls moisture in any closed area up to 8,000 cu. ft.

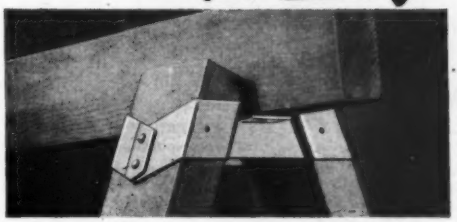
HOW DEHUMIDIFIER WORKS



See your Frigidaire Dealer for further details. Or write Frigidaire Division of General Motors, Dept. 2122, Dayton 1, O., for free descriptive folder. In Canada, Toronto 13, Ont.

Built and backed General Motors

HOW TO... SET UP and KNOCK DOWN SAWHORSES FAST!



USE STRONG, PRECISION-ENGINEERED

NU-WAY SAWHORSE BRACKETS

Set up or knock down sawhorses in jig time! Carry them in your car — or store them easily — the modern way . . . the NU-WAY!

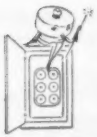
SEE Your Hardware, Lumber or Paint dealer NOW!

ONLY **$1.50** Pair ($1.60 West of Rockies)

THOMAS PRODUCTS CO., 8490 Lyndon Ave., Detroit 21, Mich.

Now! permanent circuit protection at a new low cost!

MINI-BREAKER®



Fits like a fuse in any standard Edison base fuse socket! Safely interrupts dangerous overloads and short circuits!

New safety, new convenience, new "push-button" protection against the danger of electrical fires! Yes, once you've installed amazing new MINI-BREAKERS, you can say "goodbye" forever to all the annoyance and expense of replacing expendable "one-shot" fuses. Because, whenever your circuits become dangerously overloaded . . . or when a "short" occurs for any reason . . . MINI-BREAKER trips instantly, breaking the circuit. Then, as soon as the circuit is safe again, all you have to do to restore electrical service is press the shock-proof reset button. Simple, practical, fool-proof! Inexpensive, too! Because you can install them yourself in a matter of seconds . . . just like an ordinary expendable fuse. No additional equipment to buy, no special wiring required!

The only device of its kind listed by Underwriter's Laboratories!

UNCONDITIONALLY GUARANTEED when installed on corresponding 15, 20, and 30 ampere A.C. circuits up to 125 volts maximum. **$1.50**

SEE YOUR DEALER or send for complete information today!

MECHANICAL PRODUCTS, INC.
1824 River Street • Jackson, Michigan

Please rush me full details on new MINI-BREAKER today!

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Studebaker with a Cadillac Engine

[Continued from page 210]

ped up for speed weren't good for anything else.

That's when Frick began making Fordillacs. He used Fords for low chassis and body weight and Cadillac engines because they fitted handily in the Ford chassis. At last he got performance. His cars could go from zero to 80 miles an hour in 15 seconds and top 115 miles an hour. When he switched from a 3.73:1 rear axle to a 3.31:1, he boosted the speed to 123.

Impatient to Try First Conversion

The Studillac idea was born months ago when Frick heard that Studebaker was going to adopt European styling. He sat down and began thinking. He thought about the Studebaker chassis and engine installation, and presently he decided maybe a Studillac could be built without too many changes. He could hardly wait to get his hands on a Studebaker for his first conversion.

There are a lot of tricks to Frick's trade, and he knows them all. He had to develop a lot of know-how on the Studillac as he went along. How do you modify a 1948 Chevrolet cross-member engine support to stiffen a 1953 Studebaker frame and support the rear of a 1953 Cadillac engine? Frick found out how.

He knows that eventually his competitors will learn to make Studillacs too. But competition doesn't bother him.

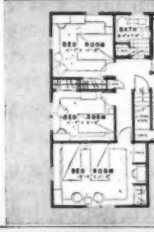
Nothing much of anything bothers Frick. "You know," he says, thinking and taking a final turn on a cylinder-head nut, "there aren't very many guys who can do what they like to do most, and make a living at it." END

Million-Dollar Look

"Good heavens," said a guest at a party, "look at that long and lanky girl over there."

"Not so loud," whispered the host. "She used to be long and lanky, but she just inherited a million dollars. Now she's tall and stately."—*Dodge Job Rater.*

You can build a PEASE Home yourself ...and save!



The "Kirkwood" with open breezeway and single car garage.

Save more than $1000 . . . Save more than 60 days

It's easy for you to build a spacious, distinctive, modern PEASE-FABRICATED HOME because we take care of the thousands of painstaking building details for you. As a result, your home can easily be put under roof and enclosed, safe from the weather, within a week. From then on you can finish it at your convenience.

Often, you can move into your PEASE-FABRICATED HOME more than two months ahead of the usual schedule. Best of all, you cut building costs more than $1000. Engage a contractor and you still save money. Choose from 2, 3 and 4 bedroom homes offering many designs, variations, custom-built individuality and unsurpassed QUALITY. You'll be proud you built a PEASE!

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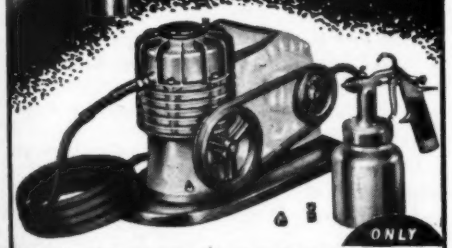
The easy way to paint!

Speedy Sprayer



ONLY **$36.50** Less motor

Favorite of home owners and craftsmen for 20 years! SPEEDY SPRAYER gives your work that professional paint finish everyone admires. Sprays paint, enamel, varnish, lacquer, etc. . . . 4 to 7 times faster than hand brushing! Lightweight, portable, uses any ¼ H.P. motor. Improved diaphragm principle assures clean, oil-free air. You'll find dozens of time and money saving uses for SPEEDY SPRAYER, including spraying insecticides 2-4-D and DDT. Complete outfit, without motor, only $36.50

At leading hardware, lumber, and auto supply dealers.
FREE—*write for handy booklet "How to Spray."*

W. R. BROWN CORPORATION
2637 N. Normandy Ave. • Chicago.39, Ill.

NEW Atlas GRINDER-HONE

Slickest Tool You've Ever Seen!

This unique new combination grinder and hone enables you to put a perfect edge on almost any tool or implement — from knives, scissors, hatchets, garden tools to plane blades, chisels, drills. Add a wire brush or buffing wheel and you're set to clean and polish a host of equipment.

The 6" grinding wheel turns 3000 RPM, the 5" oilstone hone (with 120 and 320 grits) turns 110 RPM. Tool is ruggedly built—grey-iron base, sealed-for-life ball bearings and Oilite bearings. Weighs 22 lbs. Operates from ¼ to ⅓ HP, 1725 RPM motor. See your Atlas dealer, or write for literature. Price F.O.B. Kalamazoo $31.50.

ATLAS PRESS COMPANY
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Atlas DEPENDABLE QUALITY TOOLS SINCE 1911

The Easy Way to do Expert Carpentry and Cabinet work . . .

Use a Router by Porter-Cable *Quality Electric Tools*

● It takes modern, precision tools to do expert carpentry and cabinetwork quickly and easily . . . tools like Porter-Cable's Router, Plane and Shaper. With them, home craftsmen can get professional results on a list of operations that are difficult by hand, but simple and accurate by machine.

ONE MOTOR powers Router, Plane and Shaper — 115-volt, AC-DC, 20,000 RPM. Easily, quickly interchanged from tool to tool.

● Rout beaded edges tongue, groove, rabbet, dovetail, carve on wood, plastic and composition.

● Plane dead-flat edges at accurately-set depths on bookcases, kitchen cabinets, pantry shelves, doors, etc.

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SAVE $89.50

If bought separately, each tool complete (motor with attachment) costs:

ROUTER	$49.50
PLANE	65.00
SHAPER	79.25
	$193.75

Using one *interchangeable* motor, the trio costs 104.25

YOU SAVE $89.50

Buy one complete tool now and add other attachments later, or buy all three now. Either way, you save!

PORTER-CABLE Machine Co.
1467 N. Salina St., Syracuse 8, N. Y.
(In Canada: Strongridge, Ltd., London, Ont.)

Send full information on the Porter-Cable Router, Plane and Shaper — also name of nearest dealer.

Name.....

Address.....

City..... County..... State.....

Manufacturers of SPEEDMATIC and GUILD Electric Tools

How to Outwit Poison Ivy

[*Continued from page 120*]

your family gets a case, see your doctor. For one thing, he will be able to diagnose it. Many similar skin poisonings are due to other causes. For another thing, although he will have no specific cure (there is none), he can probably provide something to ease the pain, itching, and burning.

For yet another thing, self-treatment is risky and a doctor knows how to help nature cure you in about 12 days, maybe fewer. If new skin poisoning appears as time passes, either you are re-visiting a source of infection (an ivy patch, or your steering wheel, work clothes, shoes or garden tools to which sap is adhering), or the poisoning is not from poison ivy.

Ivy poisoning will not spread across your skin by itself, and will not expand because of your scratching. It will appear in new places of course if you spread the sap with your hands.

You Can Get It by Parcel Post

Other people cannot catch poison ivy from your rash or blisters. But even though it is not contagious, poison ivy can sneak up on you not only via golf balls or across 500 miles via parcel post, but also from such things as ivy twigs clinging to fire logs, or from ivy roots among roots of other plants you're digging.

The sap sticks to almost anything—it is found in almost every part of the ivy: roots, leaves, twigs, stems, or unripe berries of the plant, maybe even in the wood itself.

But if you eradicate poison ivy in your neighborhood, recognize it elsewhere, and keep away from it, you will probably avoid breaking out with the rash altogether. If so, you will have sidestepped the greatest drawback to outdoor living in the U. S.—*Gardner Soule.*

Hole in One

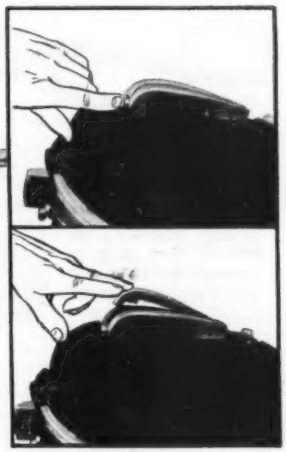
THE man who pokes fun at a woman trying to drive a car through a 12-foot garage door usually sobers up when he tries to thread a needle. —*Pure Oil News.*

RED HOT NEWS for Fishermen!

KIEKHAEFER

MERCURY Mark 5 with

Push-Button Neutral Clutch



The Only 5 H.P. Fishing Motor with All These Features:

- Push-Button Neutral Clutch
- 360 Degree Steering
- Dual-Purpose Drive — for truly weedless operation
- Multiple Disc Propeller Clutch — eliminates shear pin
- Superior Idling — for slower, smoother trolling
- Full Jeweled Power — ball and roller bearings throughout
- Variable Volume Rotex Water Pump — with low level water inlet
- Uni-Cast One-Piece Gear Housing — no gaskets to leak or soften
- Weight — Only 40 Pounds
- Performance — unmatched by any five!

The Simplest, Smoothest Neutral Clutch On Any Outboard — with FINGER-TOUCH ACTION!

It's another great pace-setting Mercury development . . . the new Mark 5 with new Push-Button Neutral Clutch! Simplest, smoothest-working Neutral Clutch on any outboard—touch the button, and you're in neutral. Touch the handle lever—and away you go!

Kiekhaefer determination to make the best outboard today even better tomorrow . . . that's the tradition that makes Mercury a leader in the outboard field, makes Mercury America's most-wanted outboard!

See your dealer for a demonstration of the new Mark 5 with Push-Button Neutral Clutch. He's listed in the yellow pages of your phone book.

Write for FREE illustrated catalog! Kiekhaefer Corp., Fond du Lac, Wis.

Features of Mercury motors are protected by issued or pending patents.

NEW P & C
SNIPS

These versatile, all-purpose P&C Snips are at your tool dealer's in four types and 11 sizes. They are designed for smooth, speedy, accurate cutting with minimum effort and strain. Like all P&C quality tools, they're "the best money can buy". Fully guaranteed.

Cut almost anything
sheet metal, screen, wire, ducts, straps, linoleum, carpeting, canvas, rubber, leather, plastics, fibreboard, cardboard, and many more.

Buy P&C Tools from this handy display.

Send name, address, 10c for complete 48-page catalog. Complete information on 500 P&C Tools.

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DO IT EASIER, BETTER, CHEAPER & FASTER WITH THE AMAZING NEW

KAKEST MORTAR PLANE

PRICE ONLY
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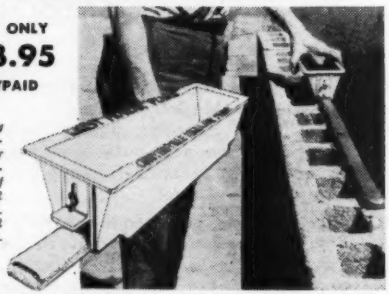


Even if you never laid cement or cinder blocks before you will be thrilled with the professional job you can do using this clever device. It is impossible to work as fast and neat with a trowel and mortar board. Why, in one day you will pay for the KAKEST MORTAR PLANE just by your savings of mortar and working time (to say nothing of the backaches and arm aches you will avoid!).

EASY: Even a child can use it. Weighs only 1½ lbs. Just set the end gates to the thickness you want, fill with mortar, "jiggle" the Mortar Plane as you slide it along the blocks on its own guides. The uniform ribbon of mortar gives complete levelness and requires less tamping.

KAKEST CO., Curwensville, Penna.
Gentlemen: Please send me Kakest Mortar Plane for laying concrete blocks. Enclosed check or money order for $13.95.
Name.....
Address.....

They Trap Counterfeiters Everywhere

[*Continued from page 53*]

of counterfeit dollars in the world. Somodoff was the pupil of Ivan Massagdoff, white-bearded former professor in the Beaux Arts Institute at Moscow, who has a long string of convictions in the bogus-money game himself. Somodoff ran up an illustrious record before the war but he has not been caught in any funny business since. However, Interpol keeps an eye on him—he's now in Uruguay—just in case.

Time Ran Out on Nazis

Somodoff was the chief designer in Sachsenhausen concentration camp, where the Nazis had their bogus-money factory in World War II. There were many others with criminal records among the 140 men recruited by the Nazis from the concentration camp. In fact, it was only by turning to the "professionals" that Himmler was able to produce the perfect five-, 10- and 50-pound notes that he wanted. Earlier attempts, using German government engravers, had fizzled.

During 1944 and early 1945, these professional crews at Sachsenhausen, working two 12-hour shifts, produced between eight and nine million notes, worth an estimated half billion dollars. Of these, three million were so good that even the Bank of England didn't notice the difference. Then time ran out on the Nazis in the spring of 1945 and American troops closed in.

140 Counterfeiters Turned Loose

Himmler ordered the bogus money buried, burned or dumped in the river, and the greater share was thus disposed of. The frantic Nazis ordered 140 counterfeiters liquidated, but due to an error in the transmission of the orders they were all liberated instead, turning loose on the world the largest gang of trained counterfeiters ever assembled.

Somodoff had originally been brought in to design counterfeit dollars and he turned out an excellent product. A great

[*Continued on page 218*]

Lt. Wt. Aluminum PIANO HINGE

Length 72 inches, thickness .040—width 1¼"—

Operating radius 275 degrees. Made of aluminum alloy, sold in 6 feet lengths only—per length ... **$1.15**

HEAVY DUTY STEEL PIANO HINGE

Length 56"—Thickness 3/32"—Width (open) 3-5/16"—Operating radius 330 degrees—Made of heavy duty steel—Drilled ready for use. Ideal for drop tables, heavy tool boxes, heavy doors, and many other uses where heavy hinges are required. Sold in 56" lengths only. Ship. Wt. 7 lbs. **At a fraction of original cost $1.45**

LIVE RUBBER SHOCK CORD

Made in accordance with rigid army specifications. Clean fresh stock. ¼" contains approx. 40 strands of live rubber. ⅜" approx. 100 strands. ½" approx. 500 strands, etc. Sold in 25 ft. lengths or more. At about 20% of original cost. Excellent for marine and boat supplies, for trampolines, for tying down tarpaulins, etc.

DIA.	PRICE (per 25')	SHIP. WT.
¼"	$2.00	2 lbs.
⅜"	$2.75	3 lbs.
½"	$3.25	4 lbs.
⅝"	$4.50	5 lbs.
¾"	$5.75	6 lbs.

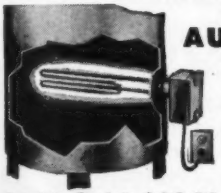
Quantity price on application.

Prices F.O.B. Chicago. Include approx. postage on orders paid for in advance. C.O.D. orders enclose 25%, balance sent C.O.D.

U. A. S. Corp. Dept. PS-7 5637 W. 63rd Pl. Chicago, Ill.

New Low Cost Electric Water Heater Gives You HOT WATER AUTOMATICALLY

From Your Present Tank!



- No dirt, grime, soot, flame!
- SAFE! Every part UL approved!
- Install in 10 Minutes, or less!
- No new tanks or plumbing required.
- Works automatically—saves on fuel bills!

New, UL approved LECTROMATIC changes gas, coal or oil-burning water heater into modern ALL-ELECTRIC unit! Turns on automatically when needed, shuts off automatically when water is heated. To install, simply shut off water. Screw LECTROMATIC into opening (as shown), then PLUG IN any 110 volt AC outlet. Uses 1250 watts. Plenty of hot water all day long. Uses only ¼-½c electricity per gal. of hot water. Temp. adjustable from 100 to 180 degrees. Save postage. Send check or money order for $19.95 now. Money back in ten days if not delighted. Full one year guarantee! ORDER NOW!

Complete—Ready to Plug In—Only $19.95

COLLOID EQUIPMENT Co. Inc. Dept. PS-7, 50 Church Street NEW YORK 7, N. Y.

NEW, IMPROVED CALCULATOR FOR WOODWORKERS only 25c

Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to convert linear to board feet, find bit sizes for screws, compare characteristics of woods. 6" diameter heavily varnished cardboard. Send 25c, no stamps, please to Greenlee Tool Co., 2127 Columbia Avenue, Rockford, Illinois.

SAVE MIDDLEMAN'S PROFITS ...buy DIRECT from C&H

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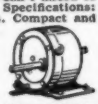
Extra soup and go at a price you can't afford to miss! Mfr'd by Borg-Warner. Specifications: 7½" deep, 7" high. Wgt. 17 lbs. Compact and sturdy, 4 base mounting holes, ¾" outlet, ⅝" shaft with female Lovejoy coupling. Priced today at $85. SPECIAL! NEW only $31.00. Used $18.95.

Sensational Winch Values! Power and hand models for boats, trucks, farmers, loggers, contractors, etc. Prices start as low as $16.95. Send for CATALOG.

Also parts, plans for dummy & incline elevators as described in April Pop. Science pp. 240-41. Send 25c for Build-it yourself diagram.

80-1 ratio Gear Reducer



Double reduction—reduces 1/6 to 1/2 HP electric motors 1750 rpm to 22 rpm. Reg. $45. NOW $28.

RUBBER HOSE

Long wearing GOODRICH 2 ply 2" I.D. 25 ft. lengths worth $25. Only $4.95: 3 lengths for $12.00.

Hundreds of $5 saving buys. These are a few of the many items at sensationally low prices!

Pumps, Tools, Drop Cords, Generators, Compressors, Saws, Clutches, Air Tanks

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Get a hallicrafters

Enjoy the thrills of short-wave at down to earth prices. Now, for no more than you'd expect to pay for an ordinary radio, you hear regular broadcasts plus London, Paris, Moscow – ships at sea, aircraft and police calls – amateur broadcasts, emergency frequencies – and much more.

These are radios made by Hallicrafters, for years the leading manufacturer of precision communications equipment for the armed services, and for years the favorite of America's ham operators. Write for FREE information on the Hallicrafters line of outstanding receivers and transmitters.

HALLICRAFTERS MODEL S-53A—Only $89.95

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Automatically protects family, food, guests from disease-bearing pests

SILENT! COLORLESS! STAINLESS!

Here's the greatest boon in years to cleanliness, sanitation and more comfortable living. Now at last you can protect any room in your home from flies, mosquitos and other small flying insects.

Never before such wonderful freedom. And so easy to use. Simple as turning on a light bulb. Just place the Champ in any socket. Within seconds this miracle bulb starts to work, vaporizing a pellet about the size of an aspirin, that means sure death to small flying insects.

CHAMP INSECT BULB

2.98 complete with 6 weeks supply of pellets or $3.98 with season's supply

on sale at all dep't, drug, food, hardware stores or send $2.98 (COD's accepted plus postage) to

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Reg. U.S. Pat. Off.

New Gadget Dispenses "Instant" Shave Lather!

Now, science has declared "push-button" war on whiskers! Rich, creamy lather right out of a can . . . no brush, no greasy cream. Just push valve—out comes lather! It's the greatest shaving invention in 50 years. New AERO SHAVE contains 3 beard-softeners, wilts toughest whiskers in hard or soft water. And built-in Lano-Lotion soothes your skin. For slicker, quicker shaves, switch to the AERO SHAVE Lather Bomb. "Canned Lather"—ready to use! Only 59¢.

They Trap Counterfeiters Everywhere

[*Continued from page 216*]

many of these were distributed before the jig was up and "Sachsenhausen dollars"—some 3,000 so far—are still popping up all over Europe. Of the 3,000,000 highest-quality pound notes, about 1,600,000 have been accounted for, according to Interpol records, while 1,400,000 have not.

Most of these may now have been destroyed, but Sachsenhausen pound notes are still turning up in one part of the world and another.

Interpol Clams Up on Cold War

Interpol's anti-counterfeiting operatives continue to keep an eye on the remnants of this huge counterfeiting mob collected by the Nazis, not so much because they expect it ever to get together and start operating again but just because it's part of every day's work to keep counterfeiting from raising its ugly head anywhere in the world.

When you ask Interpol sleuths what part the organization would play in case some country started using counterfeiting as a weapon, in cold or hot war, they just smile and shake their heads. Interpol, you are reminded, is purely a police organization and does not enter into political activities of any kind.

But its officials will not deny that Interpol's experience and techniques provide a far more effective defense against international counterfeiting than we had when Hitler and Himmler almost pulled off their scheme only a little over eight years ago. END

Sprint Training

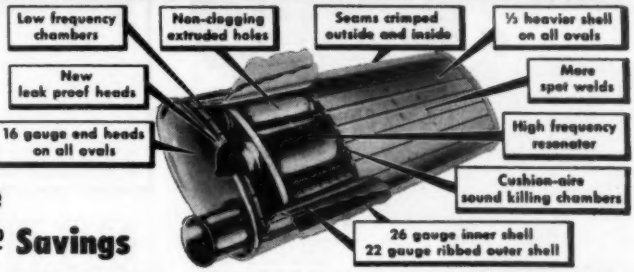
A BIG-GAME hunter in Africa was on his way back to camp one night when a big lion came out of the jungle about 20 feet away. As the lion was about to spring, the hunter fired his last cartridge and missed. The lion sprang too far and landed 15 feet beyond the hunter, who then ran for camp and made it safely.

The next day the hunter went to the back of the camp to practice a little shooting at close range. He heard a strange noise in the brush and investigated. It was the lion—practicing short leaps.—*The Right Hand.*

All Mufflers are NOT Alike

SILENTONE gives you

- ★ Safety
- ★ Power
- ★ Long Life
- ★ Up to $8.00 Savings



These features show why Silentones are the highest quality mufflers. They're made to car factory specifications or better • scientifically designed to lower back pressure which robs your engine of power • made of heavy steel inside and out. Because Silentone Mufflers are sold only through leading automotive chain stores, you save as much as $5.00—up to $8.00 if you install it yourself.

DYNATONE — The Deep, Mellow Tone Muffler That's Engineered—Not Packed

Tuned for each make of car . . . costs less than "Hollywoods" • lower back pressure • more gas mileage • longer life. Ask about Dynatone duals for greater power and gas savings.

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AMAZING, PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from sweepings. Clear alley of harmful tacks, nails. Many other uses. Pays for itself quickly. GUARANTEED. Try any magnet one week. Money refunded if you are not well pleased.

No. S-725 (Weighs 54 oz.) Has pull of 225 lbs. on steel block $15.00
No. S-675 (Weighs 49 oz.) Has pull of 175 lbs. on steel block $10.50
No. S-650 (Weighs 41 oz.) Has pull of 150 lbs. on steel block $ 8.50
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No. S- 30 Hobbyist assortment of six small magnets . . . . . $ 1.50

Send Money Order or check. We pay postage. No C.O.D.'s.

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600-16	$4.10	820-15	$5.35	600-20	$7.10	32x6(8)	$8.55
650-16	5.55	700-15	4.50	650-20	7.85	32x6(10)	9.85
700-16	5.00	670-15	4.45	700-20	8.45	900-20	13.15
450-15	4.35	710-15	4.65	750-20	8.55	1000-20	13.75
750-15	4.95	550-17	4.45	825-20	14.65	1100-20	13.85

EXTRA SPECIAL 30 MONTH WRITTEN GUARANTEE

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600-16(6)	6.4:	640-15	5.05	750-16(8)	10.75	750-20(10)	15.45
650-16	5.85	670-15	5.55	700-17	9.85	750-20(8)	15.05
650-16(6)	7.35	710-15	5.75	750-17	11.75	825-20	18.35
700-16	6.45	760-15	6.05	750-15	13.95	900-20	17.25
750-16	9.25	800-15	6.55	825-15	12.95	1000-20	17.75
525-18	5.00	820-15	6.65	600-20	8.75	1100-20	19.55
550-17	4.95	670-16	6.35	650-20	10.25	1000-22	19.45
650-15	5.35	760-16	7.15	32x6(8)	11.15	1100-22	20.45
700-15	5.45	700-16(6)	7.65	32x6(10)	11.75	1200-20	29.95

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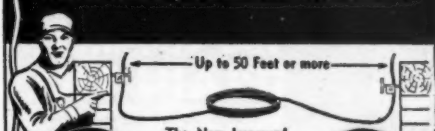

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Anything you need level Levelall does it. Dealer inquiries invited

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A sturdy instrument that can be left on the job for any workman to use. Cannot be put out of adjustment and even with the most casual handling its principle is so simple anyone can level points quickly and accurately.

For footings, forms, batter boards, sills, lintels, floors, ceilings, roads, driveways, lawns, piping, farm contouring and all general construction work normally needing an expensive instrument.

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Complete with instructions, high quality vinol polychloride tubing filled with Level-Flo Liquid, mounting brackets, and metal case.

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MORE MODELS
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Easy to operate—Uses low cost Soda Cartridges. Cal. .22 or Cal. .177 Benjamin H-C Pellets & Darts or BB. **Write Today for Illustrated Folder of All Models Benjamin Air Rifles and Benjamin Air Pistols.** **$13.50 up.**

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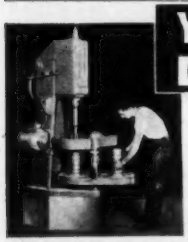

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Millions of dollars' worth of drain tile are used annually. Much of it, ordinarily, is shipped from far distant points. *Local* manufacturing is economical, logical, profitable. The Champion Drain Tile Machine makes manufacturing easy. Pares production costs. Requires no skilled labor. Makes all sizes from 3" to 12". Yet requires only a moderate investment.

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- ★ Fits in your shirt pocket
- ★ Only 2 inches wide, 5 inches tall
- ★ Covers the standard broadcast band
- ★ Plays as you walk along anywhere
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POCKET-PAL is not a toy or gadget with dangling wires or silly clips to attach, but a REAL PORTABLE for indoor or outdoor use. This unique set features attractive metal case, variable condenser tuning, volume control with switch, fibre chassis with spring copper battery contacts and many expensive precision parts. Set can be assembled by anyone, using clear PICTURE PLANS, in an evening. Complete prefabricated kit, including all tubes, ONLY $9.95 postpaid. Midget batteries $1.75 per set. Use any earphone or hearing-aid unit furnished at wholesale cost. POCKET-PAL is GUARANTEED TO DELIGHT YOU or prompt refund. Order with confidence direct from WORLD'S LARGEST MANUFACTURER of prefabricated miniature radios. **$9.95**

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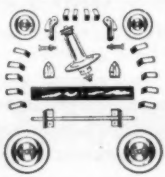

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New cheap oil burner sets in fire-box of your furnace, heating or cooking stove. No more drudgery of coal and ashes. **Sold on a 60-day MONEY-BACK GUARANTEE plus $1.00 bonus offer.** Send no money. Write for details today

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Model 6-12P
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All job except those so indicated (*) which are postpaid. No parcel post over 20 lbs. Weights indicated are app. shipping weights.

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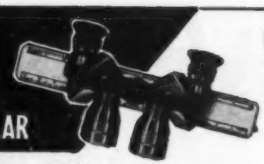

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Weighs 6½ oz.! Yet, a FULL 10 POWER with color corrected Achromatic lens. Interior surfaces of VITAL front and rear Achromatics are COATED to assure brighter, sharper, clearer images! Made by skilled optical craftsmen of precision, quality materials to rigid UNITED requirements. It explains why Price is **LOW**, Quality is **HIGH**. With genuine leather case, straps. **$24.95. OTHER POCKET MODELS.** 6x Duo-Tone–**$17.95**, 7x All Chrome–**$19.95.**

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Sprays Area Up To 50 Feet All Around

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20 ft. length . . **$2.50**
50 ft. length . . **$4.75**

7-Day Free Trial—Send payment now for sprinkler you want. We pay postage. C.O.D.'s also accepted (you pay postage). Money back within 7 days if not absolutely delighted. Order NOW!

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AIR COMPRESSOR

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TOURISTS • PICKNICKERS • WORKERS

COOK ANYWHERE—*with Safety!*

—with this world-famous portable **safety** stove, the OPTIMUS, imported from Sweden. Burns kerosene: no wick, no smell, no smoke; no sooty utensils to scour!

Clear, blue gas flame gives steady intense heat—instantly (boils water in 3½ minutes). One filling lasts hours—costs less than coal! Rugged construction, polished brass. Weighs only 2 lbs., 6 oz. 8" high. Dismounts to fit handy, square box.

An unbeatable value at only $7.49 prepaid, direct to user. Don't wait to enjoy good, hot food wherever you are. Send $7.49, ck. or M.O., for #45 Optimus Stove. Immediate shipment guaranteed. Address—

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Dept. 3-P ROBERT E. MILLER & CO., Inc., 35 Pearl St., New York City 4

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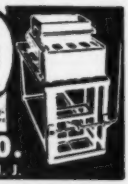

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700x16	7.75	700x15	5.75	700x20	12.50	1100x20	26.75
750x16	12.50	710x15	6.50	32x6(8)	11.95	1000x22	19.50
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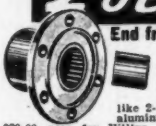

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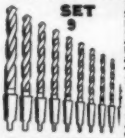

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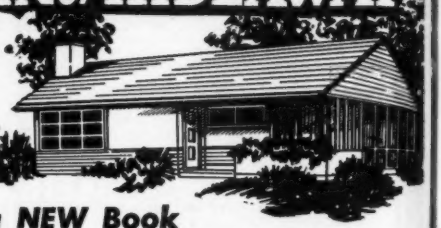

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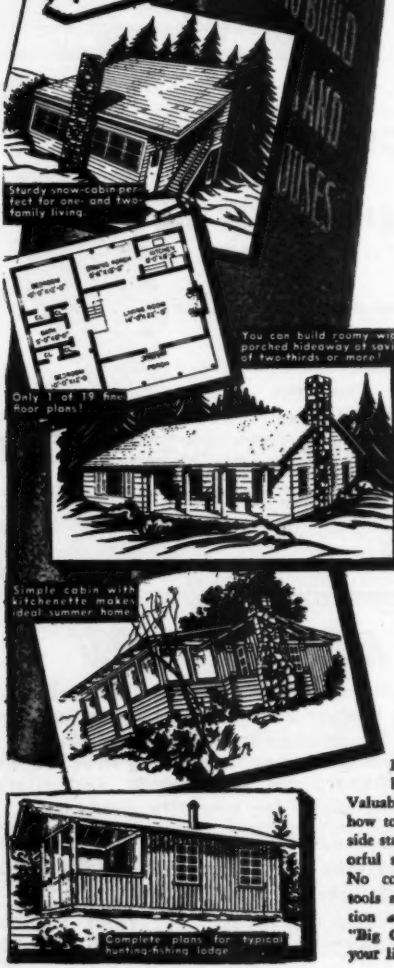

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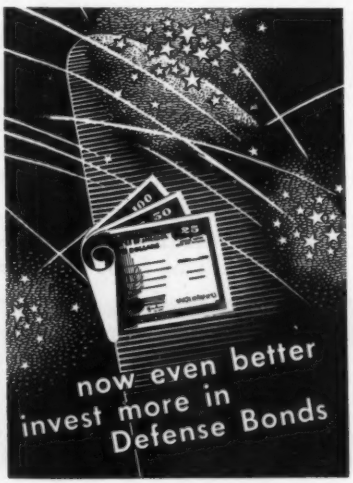

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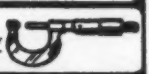

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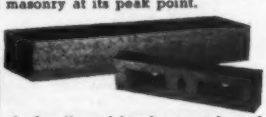

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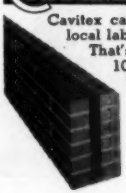

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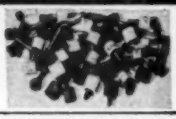

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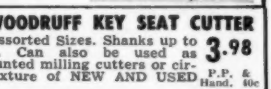

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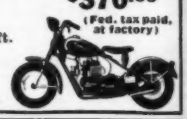

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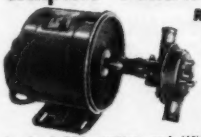

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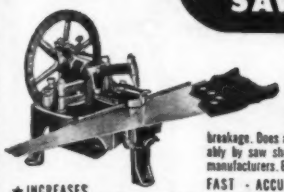

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650-15	3.94	800-15	5.04	32x6(8)	8.34	1000-20	13.34
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750-16	6.84	800-15	6.84	700-18	15.84	900-20	17.04
650-19	9.94	820-15	6.74	600-20	8.54	1000-20	18.24
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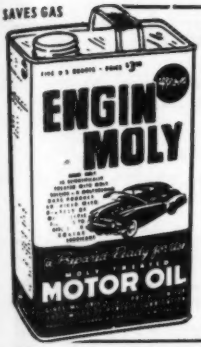

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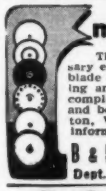

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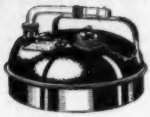

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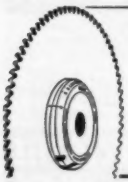

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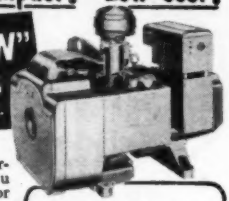

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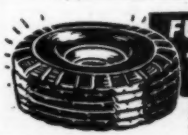

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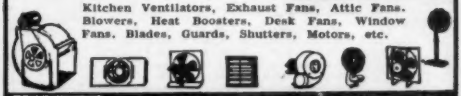

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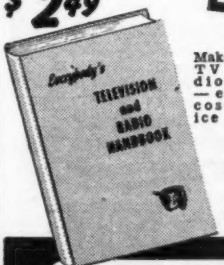

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A 2 cylinder, piston type Air Compressor. Ideal for spraying, inflating, air tools. Used in garages, shops, laboratories – on trucks, tractors, jeeps, etc. Will run off fan belt or power take-off. Operates on 1/2 HP, Gas or Electric motor. Runs in either direction. Delivers approx. 3.27 CFM at 600 RPM or 6.54 CFM at 1200 RPM. Has 2" bore, 1-1/2" stroke. Automatic clutch. Size: Width 9", height 11-7/8", depth 5-3/4". Approx. weight 22 lbs. We have motors, tanks and fittings to adapt this unit. 23.95

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Man-Made Meteors to Spy on Space

[Continued from page 97]

Observers were set up around the rocket firing field and stationed in observatories in neighboring states to photograph the trails of the artificial meteors with a series of telescopes.

But the experiment didn't pay off. At the crucial moment the firing mechanism for the meteors failed.

Neither the necessary funds nor the firing facilities have been available for further high-altitude experiments with artificial meteors. Meanwhile Dr. Zwicky is experimenting with various charges to find the most suitable size and shape, and various inserts—both solid and liquid—to find the most efficient. If he can get the money, charges will be released at ever-increasing altitudes—from planes, antiaircraft shells, high-altitude balloons and rockets.

Could Explore Moon's Surface

In time, Dr. Zwicky believes, we will not only produce artificial meteors which act as satellite missiles or pioneer in interplanetary flight; we may well be using them to bombard the moon. By observing the flash made by a meteor on impact, and by analyzing the flash spectroscopically, the moon's surface can be explored for its chemical constituents.

"In trying to find a master key to space travel," as Dr. Zwicky puts it, "we must first throw a little something into the skies, then a little more, then a shipload of instruments and finally ourselves."

Today we know only that beyond our reach there is an enormous physics laboratory where great experiments are constantly in progress. We've got to find out a lot more about what goes on there before we ever put space travel on a commutation schedule. END

Off Key

Soprano: "Your accompaniment certainly doesn't suit my voice."
Pianist: "Madam, I've tried all the white keys and all the black keys, but you sing in the cracks."—*The Wyatt Way.*

Gus Calls a Close One

[Continued from page 148]

he'd made on the gas line. Had there been something queer in the feel of that pump when he had held it in his hands, or was he just imagining it? Tantalized by the thought, he disconnected the fabric-covered synthetic-rubber hose that connected the pump to the gas-tank line. The five-inch length of hose hanging limply to the pump outlet had a spongy feel.

Gus glanced at the clock, then at the waiting, expectant faces about him. He took a roll of friction tape from his pocket, wound several turns firmly about the full length of the hose, and replaced the pump.

"Try her now, Stan," he said.

Stan stepped on the starter, and pumped the gas. Suddenly the motor came to life.

Gus Gets Them Started

"Hop in and get out of here, you old coots," Gus grinned. "But be sure to stop in on your way back, for a permanent repair. I've only fixed you up temporarily."

"What the heck was wrong?" Stan Hicks inquired as the car roared away.

"That flexible connecting hose. It looked all right, but it wasn't. The synthetic lining was so weak that the pump action flattened it. Just like when a kid sucks too hard on a wet soda straw—no liquid gets through. The tape will stiffen it for a while."

"But," protested Stan, "that couldn't be. You got gas through that hose by working the pump by hand."

"Sure I did," Gus agreed, as he moved into the office and snapped on the radio. "That's what had me fooled. But when I was holding the pump I had the hose stretched tight, not in its accustomed bend. So the suction of the pump didn't flatten it."

Gus twisted the dial and the roar of the crowd in the Stanfield stadium filled the office. "I can just see Ezra now," he chuckled, "with his foot down to the floor boards and Tom and Pete razzing him from the rear seat. To hear those fellows yammer you'd never guess they were friends. Wonder who'll be razzing who, tonight." END

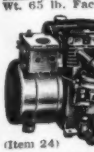
Next month: Gus gives Cupid a hand.

Times Change

IN THE good old days people turned over in their graves. Now they turn over in their cars first.—*Processing Equipment News.*

PORTABLE LIGHT PLANTS

350 Watt Plant (Item 273) 115 v. DC. 1½ hp. Briggs Engine. Perfect for lights, radios and small power tools, etc. Wt. 65 lb. Factory price..... **$99.75**



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(Item 24)

700-800 Watt Plant (Item 44) same as above but larger engine..... **$169.95**

1000-1200 Watt Plant (Item 45) same as Item 24 but with larger generator and engine..... **$199.50**

1500-1700 Watt Plant (Item 20)—Similar to Item 24, but has three times more power capacity. Wt. 173 lb. Factory price **$279.50**

MASTER-LITE 2500 Watt PLANT

110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 Briggs engine, complete with all accessories. Includes control box, voltmeter and handy plug-in power receptacle. Ideal for permanent or stand-by service. Wt. 225 lb. Regular price $645.00. Factory price. **$329.50**

(Item 21)

GIANT 2000-2500 Watt Plant—110/120 v. AC, belt driven so that engine may easily be utilized for other purposes. Powered by a rope start. 6 HP engine. Wt. 230 lb. Regular list price $585.00. Factory price (Item 31)..... **$299.50**

Generator only and control box (Item 31a) **$169.50**

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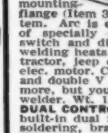

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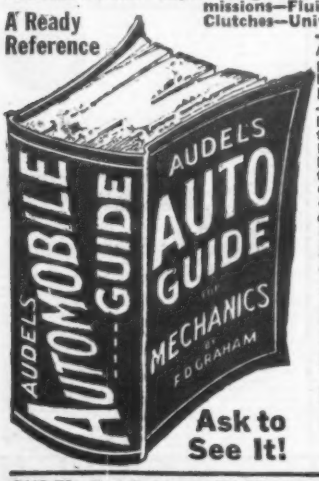

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